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Vol. 6, No. 3 (?)

The Earth Science Digest

A MAGAZINE DEVOTED TO THE EARTH SCIENCES

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IN THIS ISSUE

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The Jade Window

by R. P. MacFall, Staff Member

What is undoubtedly the most impressive of all jewels in the United States was first shown on Sept. 21, when the jade window which is the culmination of Mr. J. L. Kraft's many years of finding and fashioning American jade was dedicated in the North Shore Baptist Church, 5248 Lakewood Ave., in Chicago.

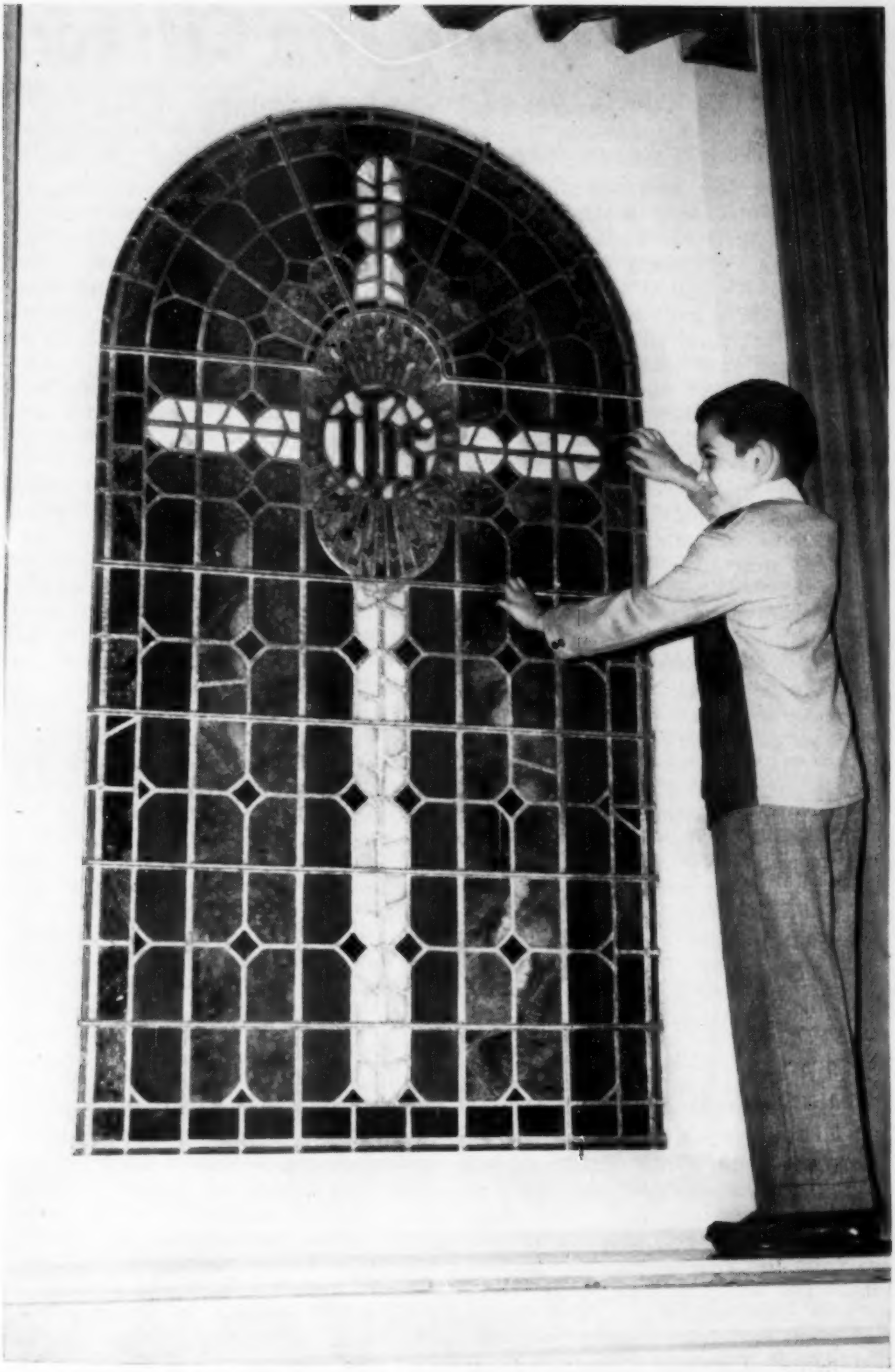
Mr. Kraft, founder and chairman emeritus of the Kraft Foods Company in Chicago, and known to all lapidary hobbyists for his writing about American jade and for his pioneering efforts to discover jade deposits on this continent, put his choicest jade and the wisdom and experience he acquired in collecting it into the making of this fabulous window. From Arizona came the white of the central cross; from California, mottled material and a rusty red jade used in an oval at the junction of the arms of the cross and in the letters inside it; from Wyoming and Alaska, various shades of green jade used in the panels of the window. Only flawless material was slabbed carefully, so that, when it had been ground and polished, the slabs were only 3 millimeters thick. The 288 panes or pieces, in 20 colors, were put together like stained glass into a window 3½ feet wide and 6½ feet high.

Most of the fashioning of the jade was done by Mr. and Mrs. E. A. Williams of Elkhart, Ind. Mr. Williams is one of the few professional lapidaries who is also an expert at leading together pieces of glass into a window, and so combines the two skills necessary to make the window. When he became ill last spring, John Grieger, the widely known mineral and lapidary dealer in Pasadena, Calif., carried on the work. In all, two years of planning and active lapidary work went into the making of the window. It will be placed in the Kraft chapel of the church, named for Mr. Kraft, who has been for 45 years superintendent of the Sunday school there, and 40 years chairman of its board of deacons.

Mr. Kraft, at 77, is still active in his basement lapidary shop, where he has made hundreds of pieces of jewelry for gifts to employes of the Kraft company and to members of his church. A specialty of his shop has been jade rings drilled from slab jade, and given for meritorious achievement in the Kraft company. Into his shop pour packages from all over the earth, bringing cutting material from folk who know Mr. Kraft's name, from representatives of his company, from friends, and from prospectors and others that he has grubstaked. Mr. Kraft has been a pioneer in the use of belt sanding for working gem materials, and has become widely known to church and club groups for his lectures and exhibitions of semi-precious gems. His own story of the search for American jade is told in his book, "Adventures in Jade," published by Henry Holt & Co.

In the orient, jade has an ethical and even a religious significance, so Mr. Kraft felt that it was equally fitting as a symbol of truth, justice and eternity in a Christian church. As such, it now stands, a giant jewel, high on the wall of Mr. Kraft's church, where, as the pastor said in the dedication service, some day pilgrimages will be made to the church by folk eager to see the window, and, as a result, the setting itself will come to be known as the Church of the Jade Window.

The cover photograph is used thru courtesy of the Kraft Foods Company. The photograph on page 3 is used thru courtesy of the Chicago Tribune. These are pictures of the same Kraft window taken under different lighting conditions.



The Earth and the Citizen

by Dr. David Delo, President Wagner College, Staten Island, N.Y.
Formerly Head of the American Institute of Geology.
Delivered during Earth Science Week at Downers Grove, Ill., Oct. 12, 1951

It is not my purpose tonight to merely recount how geological processes have influenced the economy and development of Illinois. Publications of the State Geological Survey, written for the technical man and non-scientist alike, recount these in detail. Rather, I would call your attention to the relationship between yourselves, as citizens of this democratic state and nation, and the earth on which you live. I will also make some suggestions concerning the role of the informed citizen in this relationship.

Despite some rather vague and unfounded prophecies to the contrary, civilization will continue to depend on the earth in the future as in the past. The outstanding characteristic of our civilization is industrial production based on the use of minerals which we fabricate into machines, or minerals which we use to furnish power, to drive them. The basic three are iron, coal, and oil—iron (and its alloys) for fabrication; coal for power and coke; oil for power and lubrication. These multiply men's power. Nations with adequate supplies of these three, plus adequate areas of arable land to furnish food, are strong; those without them are weak, other things being equal. Since we are still stripping the mineral cream from richly endowed North America, and our soil is fertile and well watered; and as a nation we are young . . . we are strong. Chicago, the industrial heart of the Midwest, stands where these three meet. The waterway of the Great Lakes, carved from soft rocks by the gouging glaciers many thousands of years ago, provide a cheap means of bringing iron ore from the ancient rocks of Minnesota. The flat glaciated plains made railroad construction easy, and coking coal could be hauled readily from the coal fields. Pipelines bring oil from down state, or from the southwest, so that Whiting, Indiana, supports one of the world's great refineries. Above all, the fertile plains support corn. The summer climate, with half of the rainfall in evening thunderstorms, almost pulls up the corn by the roots as it grows during the hot days of July and August. Thus we have a corn and mineral industry, a cross roads where all can easily meet; and Chicago is the result.

More obvious, but perhaps even easier to demonstrate, is the function of minerals and oil in some of our nonindustrial states. Consider the ghost towns which dot many of the mountain states. They rose on a foundation of gold or silver; but they faded when the unpredictable vagaries of geologic chance caused the bonanzas to pinch out and their inhabitants departed to seek new and more profitable climes. This demonstrates how ephemeral is a culture based entirely on mineral supplies which are quickly exhausted.

Even so, oil and gas are creating a new civilization in the southwest. Recently I flew across Oklahoma and Texas for the first time in 20 years. Where there had been nothing but barren flats two decades ago, the derricks of oil wells, new bustling towns, and developing industries showed that oil is the lifeblood of the new industrial southwest. Here again is a non-renewable source. So geologists and geophysicists in increasing numbers are combing the oil provinces with every modern device at their disposal to discover the sinews of industrial peace and national defense. At the same time, other researchers are experimenting with the production of petroliferous products from the low-grade coals which underly the great plains, and from the oil shales beneath the Colorado Plateau.

The science of geology, like its sister disciplines, is performing a fundamental service to our technical civilization. May I digress to note that this is the youngest of our modern sciences. The first professor of geology in the United States was appointed less than 150 years ago; the federal geological survey was founded to map our national mineral resources only about 70 years ago. Today only two states do not have geological surveys to assist industry and the individual citizen with scientific information. Those, like Illinois, which have had the good judgment to support an adequate geological survey, reflect this foresight in the more effective and profitable utilization of the states' natural resources.

Before proceeding to my next concept of the relationship between the earth and the citizen, may I pause to summarize briefly. We are part of a technical civilization, based in large part on the wonders of modern science. But almost all of our activities are based on the earth and its resources. The materials with which the chemist works his miracles to provide better living come from the ground, and are usually located by a trained geologist. Even the atomic physicist, with his ability to spread well-being or destruction, works with uranium which is an earth mineral produced by the natural geological processes. Since we live on the earth, the location of our paths of communication and transportation; the houses we live in; the devices and machines we use; and the food we eat are derived in one way or another from the earth.

We also live in a democracy. Like no other nation on earth, we also have universal education. This is intended to produce a literate citizenry, able to vote intelligently on national, state and local issues.

Yet how well are we succeeding in educating our citizens to understand these most fundamental relations between themselves and the earth on which they live? Is our universal education furnishing the new citizens who graduate from our high schools and colleges the necessary understanding of these factors so that they can vote intelligently? The evidence indicates that it is not.

For example, the New York Times recently conducted a survey of college students to ascertain their knowledge of the United States. The results were lamentable. Remember that they were not asked about foreign areas, but about their own country. Benjamin Fine of the Times writes in a recent issue of the Readers Digest:

"American college students know shockingly little about the geography of this country, even less about the world. In a nationwide survey recently completed by the New York Times, a geography test was given to 4752 students in 42 colleges and universities. These students represent a good cross section of the 2,300,000 college students of the nation.

"The lack of knowledge of fundamental aspects of America, the vast misconceptions of what the United States looks like are appalling, the survey shows.

"Only 17 percent could name the states through which one would pass in traveling by the most direct route between Minneapolis and Seattle. Some students listed Georgia, Mississippi and other far-removed states. Only five percent of the students could list the states that border the Atlantic Coast. They named many inland states, even going west of the Mississippi.

"Similarly, only 4.5 percent of the college students could list the states that border the Great Lakes. And although we border on the world's largest oceans, few students knew it. Only 25.7 percent could name the four largest oceans of the world.

"A previous study conducted by the Times showed that less than five percent of the nation's college students were taking even one geography course. Some educators held that geography was not needed on the college level, asserting that the high schools did an adequate job. But the wild guesses made by the college men and women on the test indicate that there is a serious deficiency in their education."

A recent survey of the teaching of earth science in Illinois high schools indicates that not only is earth science not taught for the most part, but there seems to be no conception of the importance of these studies or their relationship to other portions of the high schools' curriculum such as American history or current events, conservation of natural resources or even agriculture. The excuses by our educators that the high school curriculum is too crowded; that teachers are unprepared to teach our students about the physical environment on which our prosperity depends; or that the students have no interest in the subject,—simply beg the question. In effect, we have sold ourselves to the educational Philistines who support the unsound and anemic concept that methodology is more important than sound knowledge; that "social studies" should be substituted for detailed factual knowledge; that the intellectual discipline of having to think a problem through should be abandoned for a general survey. A study conducted by the U. S. Office of Education shows that the national situation is just as bad; only here and there such as in Joliet and a few areas in New York State is the situation more nearly what it should be.

In the colleges the situation is similar. Few college graduates have any concept of the basic conditions which determine national strength and prosperity or influence international developments. How can we expect our future leaders to have a good understanding of the world developments which affect us when they do not understand the environment in which foreign governments operate, or in which foreign people live? The physical environment, whether it be mountain, humid tropics or desert, has much to do with prosperity, how people think, and the customs which they have established over the centuries. Study of their politics or their social customs is not enough; yet far, far too often our educationists base their studies on these factors alone without considering the fundamental environmental basis of the social mores which they study.

To particularize concerning these problems, let us look for a moment at some of them with which our voters and legislators must be concerned if we expect to maintain our national vigor and an economy characterized by free enterprise. Among them are:

1. Our national use of the land.
2. The preservation and use of timber resources, and reforestation.
3. Effective utilization of our national regions of differing climate and productivity as one homogeneous national unit.
4. The water problem: Control of rivers and drainage systems to prevent floods, produce usable power, and assure maximum productivity of drainage areas, and measures to cope with the depletion of underground water, which is now becoming of national concern.
5. More effective and more stable use of such areas as the Great Plains.
6. The soil problem: Prevention of erosion and depletion; renewal of areas that have been partially exhausted and more effective use of marginal lands.
7. The problem of mineral resources: More accurate information concerning supply and demand; utilization of "marginal" deposits; a realistic national policy concerning importation of scarce raw materials to prevent peacetime exhaustion of domestic deposits which may be essential during war; more complete geologic mapping.

Further, the nature and distribution of the world's natural resources and arable lands and their political control will have an important effect on the future of our internal national economy.

Knowledge of earth science, if properly approached, would show the influence of geological and geographic factors on the development of industry, the history of settlement and the constantly changing time of international relations. Even more basically, it would illustrate cogently the impact of these factors on the life of the student himself and the world in which he lives, and be far better remembered for this reason. From the cultural standpoint, geology and related subjects also seem to offer one of the best vehicles for an understanding of the long sweep of human activity which leads us back to the caves of Asia Minor during the glacial period. For despite our "conquest" of our environment, the climate, the resources, and the geography of the land across which our race has moved have had much to do with where we have gone and how we have traveled. It would seem extremely difficult to understand human history, therefore, without some comprehension of the framework within which it occurs.

To be effective, education must be attuned to the needs of the times. I have no quarrel with those who insist that man's best study is man; that we must understand the social, political and economic developments and customs of not only ourselves but of other peoples. But I cannot agree that this is enough. The objectives of our educational system, in this technical age, must be to relate the realities of the earth to the future citizen's own life; to give him a background for meeting the scientific requirements of democratic citizenship in the modern world. May I repeat that the basis of his life will be the factors in his physical environment; weather and climate; the soil, the water, the resources both biological and mineral; the terrain. On them and their use, in the last analysis, depends whether he earns a good living, or can defend himself against potential enemies. Here in the U.S. particularly, we have been attuned for 150 years to a constantly expanding economy. During the early part of our national history, this was geographic expansion. Now we have reached our borders and are engaged in filling in the chinks. This means that increasing numbers of us must live together and like it. We must husband our resources, using them as effectively as possible to support a constantly increasing population. If we are going to continue to have a real democracy, not a directional oligarchy in Washington, this must be achieved at the state and local level, not by direction from any political headquarter. This means that our town councils, our county officials and our state legislators must understand the importance of earth factors in our economy. It also means that our citizens must have the requisite background to elect the right people, and to fail to elect those who would waste our heritage through lack of understanding, ignorance or selfishness.

There is even another side to this relationship between the earth and the citizen. In these days of cliff dwelling in large urban centers, but easy transportation in our automobiles, man can renew his vigor and calm his frazzled nerves by getting into the outdoors. You might call this getting down to earth. There is no better or more satisfying hobby than that of the amateur geologist or mineral collector. He knows the joys of the outdoors, the thrill of discovery; the satisfaction of the collector. He returns refreshed and, if he is also interested in classifying his specimens or in lapidary work, he has brought with him enough material to occupy many of the long winter evenings when inclement weather keeps him indoors. In fact, many amateur scientists have in this way made outstanding contributions to scientific knowledge.

Doubtless many of you have concluded that I am an idealist and that I am suggesting the impossible. If you look back four decades, however, you will find that earth science (or physiography) was then taught on a rather large scale in high schools. There is no reason to suppose that it cannot be revived if its obvious advantages are

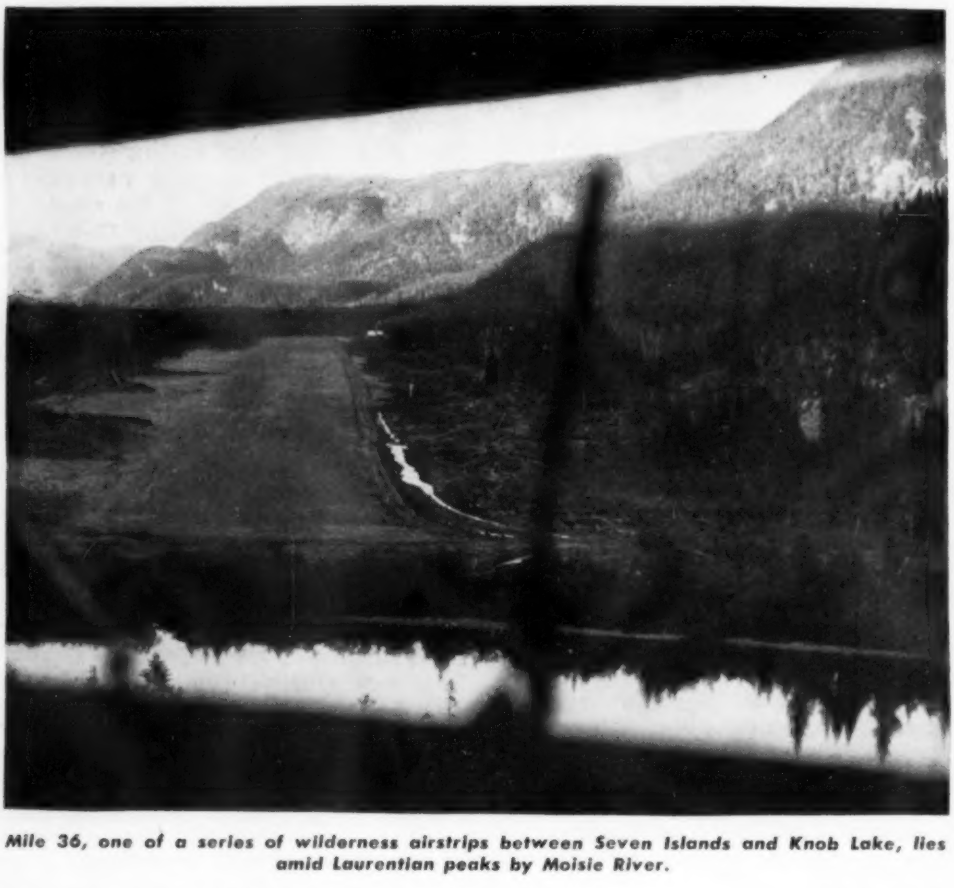
(*Concluded on page* 40)

"Ore by '54"

"Ore by '54" is the title of a refreshing story, excellently told by Paul W. Fisher in a recent issue of the "Bee Hive," quarterly magazine of the United Aircraft Corporation. It contains so much information of unusual importance and interest to Earth Scientists that we are happy for the opportunity of reviewing it for the benefit of our Digest readers.

It is the story of the important part which the "Ungava" airlift, carried out by United planes, is playing in the building of a 357-mile railroad through the uncharted Canadian wildnerness to tap what may prove to be one of the world's richest iron ore fields, and it also gives an excellent description of the nature of the deposit by leading geological authorities upon the subject, as well.

As important as this great body of ore is, due to its inaccessibility, it would be absolutely valueless, in this vast frozen wilderness, without adequate means of transportation to carry it back to civilization where it may be transformed into many articles of value and usefulness to mankind. To build 357 miles of major railroad leisurely anywhere under most favorable circumstances would be a terrific task, but to do so in the shortest possible time against untold obstacles of every description is a job which beggars the imagination. Such a task would be al-



Mile 36, one of a series of wilderness airstrips between Seven Islands and Knob Lake, lies amid Laurentian peaks by Moisie River.

C-119 Landing at Burnt Creek

Tractor being loaded into C-119 at Seven Islands most impossible were it not for men of great courage and experience, such as Al Cheesman, a bush pilot, who has spent many long years flying and handling men and materials in this great wilderness, and upon whose shoulders the responsibility for the success of the undertaking largely rests. He is a character worth reading about and the virtual hero of the story.

The builders are going about their task in an empire shaping manner. They are at work on road beds, tunnels and grades at both ends and intermediate points of the project. Already they have cut a tunnel 2,250 feet long through the top of a Laurentian mountain twelve miles above the port of Seven Islands. Construction of their first major bridge, running 750 feet across the Moisie River from that mountain, proved their next big problem, to be followed by the long push across mountains, forests, swamps, lakes and rivers ahead. But at every moment of leisure all along the far-flung venture, attention is fixed on Burnt Creek and its treasure of cinnamon-red iron ore, cropping out on the surface of the rocks, readily quarried, assaying as high as 68 percent iron, and averaging out at 59 per cent in the careful dry analyses so far made.

Al Cheesman

Dr. A. E. Moss, Geologist

A discovery of this magnitude anywhere would be breath-taking, particularly in an hour when the great Mesabi Range deposits are waning after building industrial North America and fighting two World Wars. But the truth is there is little of the "discovery" about the history of the New Quebec-Labrador ore fields. Geologists have been pretty certain since the 1890s that iron ore deposits lay there; they proved it in 1929, but only in recent years has the extent and the wealth of the lode been learned. Painstaking exploration has proved out 417,000,000 tons, and Dr. Joseph A. Retty, the senior geologist, who aptly has described the deposits as resembling "raisins in a great fruit cake," and who has been at work in the bush geologizing the area since 1936, estimates with a scientist's caution that there are at least two billion tons of rich iron ore in the area.

The deposits lie in a fold of land transecting New Quebec and Labrador among an ancient ridge of hills running northward fifty miles from Burnt

Creek to Eaton Canyon. The hills lift up to a thousand feet above the rocky escarpment of the barren land, their broad backs shining soft and gentle under the warm season's light in their cloak of rich gray-green caribou moss. The subzero winds and ice raging over them from October until June are the enemy of all plant life except the caribou moss. Under the shoulder of the hills and in the protected valleys, stands of black and white spruce grow, and there, too, are tangles of blueberry bushes and mountain laurel. Forest fires, set by lightning with its affinity for the naked iron beds, have swept through the evergreens, and only their skeletons now gleam, old and weathered, a shining gray, on the landscape.

The Labrador trough is an old, eroded and inhospitable land. Probably no corner of the North American continent is less known; the bay at its head, Ungava, means "far away" in Eskimo. The trough has been both ancient sea and mighty mountain range. To the eyes of Dr. Retty, Dr. A. E. Moss, and the other geologists engaged there, the region's history runs back roughly a billion years to Pre-Cambrian times, when a long arm of the Arctic waters ran down a depression of the land and deposited layer upon layer of rich sediments, among which were beds of ferruginous rock with an iron content of 30 to 40 per cent. Then, long after that geological age, a convulsion of the land uplifted the ferruginous strata, and a Gargantuan compressive force from the northeast caught the strata, faulting and folding the beds so that the iron formation was repeated, in Dr. Betty's phrase, "like ribs across the trough."

The iron formation itself is too lean in content to be considered as high-grade ore, worth the arduous labor of opening it to mining operations at so distant a point, but the shattering effect caused by the faulting and folding led to openings into which water poured, and circulating in the rocks, it dissolved the soluble silica. Left were the virtually insoluble iron oxides. Hence Dr. Retty's description—"raisins in a great fruit cake"—applies to the concentrates rich in iron, much of it jutting out on the surface. To tap that wealth required surmounting all the handicaps of a rigorous, barren, remote land. The only answer was the airplane.

—From The "Beehive" Quarterly Magazine of United Aicraft Corp.

Burnt Creek's 41 cabins and Quonset huts sit on iron ore deposits

NEW YORK UNIVERSITY ANNOUNCES CHANGE IN METEOROLOGY DEPARTMENT

The Department of Meteorology of New York University's College of Engineering has been redesignated the Department of Meteorology and Oceanography. Formal curricula leading to the master's and doctor's degrees will become effective at the opening of the academic year in September. In announcing the new program, Dean Saville pointed out that New York University is the first American university officially to combine meteorology and oceanography.

"The arrangement is unusual but logical," he explained. "The atmosphere is greatly influenced by the properties of the ocean, while the ocean is affected by the properties of the atmosphere. Moreover, research methods in meteorology and oceanography are similar, since both disciplines deal with media which are fluids, subject to the same physical laws.

PALEONTOLOGICAL RESEARCH LABORATORIES, STATESVILLE, N. C., ANNOUNCE OFFICIAL OPENING

This Institute, one of several similar Institutes operating under appropriations from private geophysical exploration companies, will specialize in paleontological and stratigraphical studies of the Caribbean and Latin American areas.

It will be the main function of this Institute and its staff-members to bring into its keeping, through field parties, and other interested petroleum geologists, such fossil faunas from the above areas, as may be collected and to be studied and left in this Institute, as being the major repository for such Caribbean and Latin American fossil collections as found and published by the Institute. Aside from the normal paleontologic studies, such collections will also be used, in part, for spectrochemical analysis to determine more precise geologic ages, water temperatures and salinity.

For the past six months, staff members have been engaged in preparing for subsequent field work, acquiring a suitable reference library, and comparison collections of North American and European invertebrate fossils, both through exchanges and field collecting.

CHICAGO INTERNATIONAL EXHIBITION OF NATURE PHOTOGRAPHY

Pictures from your rock hunting expeditions, and any nature subjects, are worthwhile entries for the 8th Chicago International Nature Photography Exhibition. Geological subjects are especially welcome, but there are also classes for plants and animals.

There are two divisions, one for prints and one for color slides. Silver medals and ribbons are awards in each classification.

If you have never had an opportunity to obtain a highly qualified opinion of your pictures, this is it, in the foremost exhibition of this type in the world.

Write to H. J. Johnson, 2134 Concord Pl., Chicago 47, Ill., for entry form. Deadline is Jan. 17, 1953.

ARTIFICIAL DIAMONDS

Only a Rumor, We Suspect!

By grapevine, word has recently come out of Russia that they claimed to have made artificial diamonds out of pure carbon, utilizing the heat of atomic fission, in chunks weighing up to hundreds of kilograms.

The process hinted is most fantastic. It is stated that the materials employed were let down into great depth of the Arctic Ocean (about four miles) by huge cables, where the pressure was so great that when the atomic explosion occurred strange forces operated to cause the carbon to crystallize.

Since such great heat would doubtless have melted off the cables, what they didn't explain was how they ever fished the materials out again. We're skeptical!

* * *

Give your friend an Earth Science Digest subscription for Christmas

Rattlesnake Butte, South Dakota

by June Culp Zeitner

There is something so western sounding about the name Rattlesnake Butte, South Dakota, that one expects to arrive there on a "bronc" and find Indians crouched behind the flat-top. The strange part of it is that such an impression is very near the truth.

This particular butte, or mesa, as it is called farther west, is located in southwestern South Dakota on the Pine Ridge Indian Reservation. It owes its undying geological fame to the presence of some of nature's strangest and most showy crystals, the hexagonal sand calcite crystals. Indeed this rare formation is found in only one other spot in the world. That is the Fontainbleau limestone beds near Fontainbleau, France.

Although we have lived near this location for years, and are interested in geology, paleontology, and archeology, to the extent that we have a large private museum, we had never visited the locality until last spring. I suppose we operated under the assumption that pastures were greener farther from home.

No, we did not actually arrive on the scene horseback. But a good saddle and spurs might not have been amiss even in the pick-up. A fair part of the way, trails are either cowpaths or nonexistent. The landscape features many sandy buttes, covered by prairie grasses, yucca, cactus, and a few pine trees. Indian huts and sometimes tents were infrequent signs of habitation, and occasionally we would see a ranch house in the distance.

When we finally wound around among the steep draws and abrupt rises characteristic of the country, we spotted two barren looking buttes more prominent than any others in the area. We did not know which was actually

Mr. and Mrs. Zeitner examining specimens on Rattlesnake Butte

Rattlesnake Butte. We reasoned that since the buttes were in the same field and of similar appearance, if one had sand crystals on it, so should the other. Time proved how wrong we were.

The butte, or mesa, to the north was just another of those squared off hills for westerners to give a picturesque name. All we got for our trek to it was sore muscles and sour dispositions.

But the butte to the south and east was another story. Here was the real Rattlesnake Butte. Before us was a story of grandeur and mystery, and too, a tale of tragedy. The abrupt slopes rising approximately 100 feet from the nearby field, were literally paved with small sand crystals and pieces of crystals. Part of the hill was a regular wall of smooth, fine-grained nature-made cement. But another part showed the ruthlessness with which man often treats wonders of nature. There had been blasting and digging and bulldozing. The best parts of clusters had been picked up, and the rest abandoned in helter skelter disorder.

We got out our shovel to see if digging would reveal fresh crystals. The first place we tried was as unrewarding as our trip to the north butte. But toward the crest in sort of a saddle, we dug down three feet thru beautiful quartz sand and found a hard — or semi-hard — layer of damp crystals.

The moist beige colored sand and the crystals were all the same color and texture. It was only by careful and repeated "feelings" by hand that we were able to dig out a hunk of the crystals and lay them in the sun to dry and harden. As the loose sand on the outside dried we brushed it away, and as the crystals dried they took on a lighter and glossier appearance, clean-cut and shining like gems in the sun.

The composition of these crystals is 60% quartz sand and 40% calcite. In the dipyramidal class, many of these crystals are double terminated. Many seem to be half a crystal growing from another. Sometimes single perfect crystals are found. Other common shapes are groups of two crystals in the shape of an "x," and half of a crystal standing erect in the center of a long complete one. These oddly resemble miniature submarines. The sand making up some of the larger crystals and the solid blocks of uncrystallized material is sometimes so coarse as to suggest an oölitic appearance or even conglomerate. However the average crystals are of uniform fine grain beige appearance, with tiny black and white flecks visible thru a mineral glass. The hardness is 3 on the Moh scale, and the specific gravity is about 2.5. Some of the tiny twinned crystals we found by means of sifting the sand thru a screen. They were about ¼ to ½ inch in length. On the other hand, a crystal in one large group is 7" long and 2½" in diameter.

How to get to Rattlesnake Butte from Martin, South Dakota

The largest group we decided to take home for our museum was awkward and heavy to handle. It was all my husband and I could do to carry it to the truck. The job took us half a day.

We have seen specimens of the South Dakota sand-calcite crystals in museums in nearly every state. Most of them are far from being truly representative, as many are broken and weathered. They are also labeled everything from "North Dakota lime crystals" to "Nebraska gypsum crystals." The best museum display is in the South Dakota School of Mines.

(*Concluded on page* 48)

Grinding Spheres—Equipment and Method

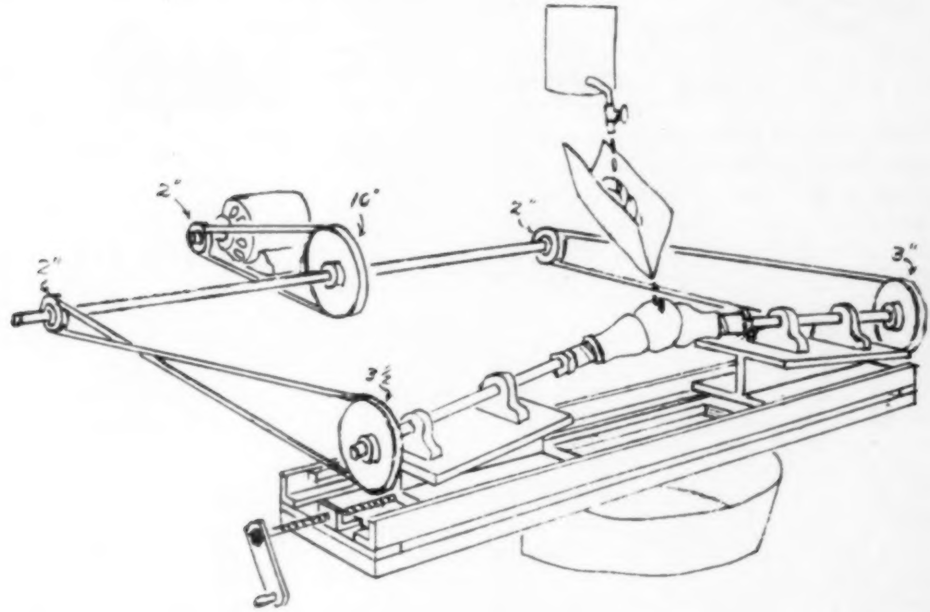
by Earl M. VanDeventer
Route 6, Caldwell, Idaho

First we had better pick up a motor of about ⅓ horsepower. This motor will turn about 1750 r.p.m. so we had better put about a 2" pulley on the shaft of the motor.

Now we'd better hunt up a piece of ⅝" shafting about 40" long and three self aligning bearings, and a couple of spacing collars so that we can hold our shaft in place. I believe that we will be able to get all this material at Sears' or Montgomery Ward's, and while we are there, we'd better get a 2" pulley with ½" bore for our motor, and we will need a 10" pulley with ⅝" bore to drive the jack shaft. This will give us about 350 r.p.m. on the jack shaft. Now we will need a 3" pulley and a 2" pulley; these will go on the jack shaft to drive our two mandrels that we will also try to pick up while we are downtown. These mandrels should be the ball bearing inclosed type so that we will be able to keep the grinding grits out of them and they should have ¾" shafts with standard bolt threads.

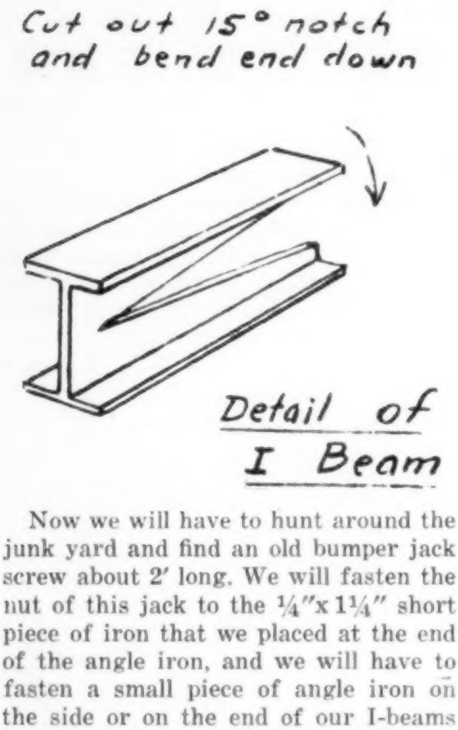
Now let's see about getting two pieces of 1¼"x 1¼" angle iron about 40" long and two pieces of ½" square iron the same length as our angle irons, and two pieces of ¼"x 1¼" flat iron about 4" long. We will have to use these pieces of flat iron to tie our angle irons together to form the run for our two mandrels.

Now for these mandrels, we will have to get two pieces of 4"x 10" web I-beam, each 10" long. We should have a V-cut taken out of the web of these I-beams so that the top of the beam will set at about a 15° angle.



SPHERE GRINDER

To the top of these beams we will bolt the mandrel and on the bottom of one of these beams we will bolt the two angle irons and with the aid of the two pieces of ½" square iron we will bolt these on the inside of the angles to form a chase or run in which the other piece of I-beam can travel ahead and back, and on the bottom of the angle we will bolt the two short pieces of 1¼"x ¼" iron. This will hold the runs from spreading and letting our I-beams get away.



Now we will have to hunt around the junk yard and find an old bumper jack screw about 2' long. We will fasten the nut of this jack to the ¼"x 1¼" short piece of iron that we placed at the end of the angle iron, and we will have to fasten a small piece of angle iron on the side or on the end of our I-beams with a hole large enough to take the end of the screw, with two small holes drilled in the end of the screw so that we can force the I-beam ahead or back as required.

Now we will have to have someone weld a short piece of 1" shaft stock about 1½" long onto the two standard nuts that came on the mandrels and then turn a ¾" pipe thread on these two pieces of shafting. We will now gather up a few pipe fittings. I use ¾" to 1½" and ¾" to 2" bushings and now we want two 1" couplings, two 1½" couplings and two 2" couplings, and two 2"x 3" reducers. These we will use at the starting of our spheres to grind off the corners, also for our larger size spheres.

Now don't try to fasten the movable mandrel down too tight. I find that it works better if it has plenty of room to wobble around in. And don't try to keep the pipe fittings in a true shape as they will cut just as long as they keep turning.

The main thing to watch is that the sphere keeps moving in all directions; if it just turns in one position it will come out egg-shaped. So just take a stick of wood and make the ball spin in all kinds of directions.

Now you should buy yourself a 100 lb. keg of #80 carborundum grit which will cost about $25.00 delivered to you, and you should get about 5 lbs. of #600 grit and some #1200 lapping compound, and some cerium oxide. Now you are about ready to make a sphere.

First cut a cube, then cut off the four corners of the cube, then make four more cuts and that will take off all eight corners. Then you can use the largest cups and place the ball in the machine and go to work, but don't try to tighten down too tight until you get the ball pretty well rounded up. It is important that the ball spins in all directions or it will get egg-shaped.

After it is true and round, I wash away all the coarse grit and then I use #220 grit applied with a brush for awhile and then I wash up again, and then I use #600 grit until I have all marks removed. Then I back out the cups and cover them with some canvas or pants legs and then I use some more of the #600 grit and after this I place a new layer of canvas over the one already on and then I put on some #1200 compound for a few minutes, then I put on some more rags over what are already on and then use cerium oxide or some other good polish.

Some stones must be run very hot while others won't stand much heat. You'll have to learn the way I did.

Nothing brings out the beauty of a stone better than a nice sphere.

Sandcasting for the Amateur

by W. A. Briggs
305 N. Brainard Ave., LaGrange, Ill.

This business of casting gold and silver into a sand mold is interesting almost to the degree of being fascinating and is extremely simple to accomplish. This work is being done by boys and girls in summer camps and as a hobby by individuals, men and women, very successfully.

To avoid the appearance of the process being complicated, it seems advisable to describe the necessary tools and equipment, in this article, then follow with a description of the techniques used in the actual casting, and the results.

The necessary equipment and tools may largely be made at home. Herewith is a list of tools and materials:

Tools

- Flask and mandrels
- Torch or other suitable heat
- Crucible and holder
- Heavy soldering tweezers
- Jeweler's saw blade
- Round asbestos pad
- Small alcohol lamp
- Various discarded dental tools

Materials

- Casting sand
- Lycopodium for parting powder
- Powdered borax for flux
- Hard Dental Wax
- Alcohol for lamp

Casting sand is comparatively cheap to buy, ready to use. Ask at your jewelers supply house for 5 lbs. of Dixon's Prepared Casting Sand. If you would rather prepare your own, it is easy to do. Purchase 10 lbs. of #2 Racine sand at your cement dealers, then, at the drug store a few ounces of glycerine. While at the drug store purchase a couple of ounces of lycopodium, to be used for parting powder.

Pour a few drops of glycerine at a time into the sand and mix well. It is best to use your hands in mixing as you can get the feel of the sand more readily. Keep trying the mixture by picking up a hand full and squeezing. When the imprint of the lines in your hands show plainly and the piece breaks cleanly from a slight bending pressure, the sand is ready to use. The sand should be kept covered when not in use as it has a tendency to dry out. Also from time to time, a few drops of glycerine should be worked into the mixture, by hand again, because the heat from the molten metal evaporates some of it.

The next necessity is a flask to hold the sand in which the mold is made. Secure a piece of iron pipe about 3" in diameter, 4" or 5" long and about 3/8" thick. These measurements are approximate, as a small variation makes very little difference. At this point the piece of pipe should be marked lengthwise on opposite sides, at exactly the half way point. Make these marks clear enough so that they will stand handling several times. Now, with a hack saw, saw the tube in two horizontally so that you have two cylinders about 2" long. See that the edges of these cylinders are smooth so that they will fit well. To go back to the lengthwise markings — we will now mount, on these marks, pins and eyes, so that the two cylinders will always go together in the same position. Out of brass or other suitable metal, saw a piece as big as a quarter, then saw this circle in half. The inside lines of these two circles should be filed to the same contour as the outside of the 2" long cylinder. These eyes are then soldered or brazed to the sides of the cylinders close to one of the edges. After the brazing operation a hole should be drilled thru these small pieces as close to the sides of the cylinders as possible. This completes the cope. Two pins, the same size as the holes you just drilled in the eye pieces, should be soldered or brazed to the other 2" cylinder, in such a fashion that the pins and eyes fit. A paint mark can then be placed along the side to indicate which pin fits in which hole, as that will make quite a difference after you have a mold in the sand.

Now we will prepare the mandrel for holding ring models. If the flask is 2" in diameter secure a piece of brass or copper tubing, not over 4" long, and ¾" in diameter. This tubing should be cut in two pieces, each 2" long. One of these two pieces should now be cut in two lengthwise, so that you have two half cylinders. One of these half cylinders can be put away in a drawer.

Thus far we have two cylinders 3" x 2", one equipped with eyes and the other with pins, one cylinder 2" long and ¾" in diameter and one half cylinder 2" long.

We will now make a core mandrel in which we will make a core to make the inside of the ring. A copper or brass tube should be provided that just slips over the ring mandrel, 1-¾" long.

The crucible had best be purchased from your supply house, together with a wire clamp to hold it during the heating operation.

On your next trip to your dentist—you had better make a special trip for this—ask him if he will give you some of his discarded tools for working in wax and a piece of hard dental wax. The tool should be heated and shaped like a small spoon on one end and a dull knife on the other.

Last, but probably most important, is a source of heat. There are many outfits on the market suitable for the purpose. However, to enumerate them would take more time and space than we have available, so we shall describe the equipment used by the author for a number of years. We use a small torch with two nozzles, one for silver soldering and the other and heavier one for melting gold and silver. Acetylene in a small cylinder equipped with regulator completes the outfit and has been very satisfactory.

The above completes the tools and equipment necessary to do very satisfactory sand casting. We do not contemplate that one can use such simple equipment on a production basis, but it has proven satisfactory from an amateur standpoint. In another issue we shall endeavor to describe the actual process of heating and casting.

OPPORTUNITY

The year 1951 was one of increased activity in nearly all branches of the abrasive industry. The United States Bu-eau of Mines divides this class of minerals into two groups, the Natural Abrasives, and the Artificial.

Of interest to mineralogists, are the Natural Abrasives, which are listed in the catagories as follows: Diatomite, Tripoli, Quartz, Ground Sand and Sandstones, Grindstones, Pulpstones, Millstones, Tube Mill-liners, Grinding Pebbles, Pumice and Pumicite, Garnet and Emery.

Many of these minerals are so common that we pay little attention to them, yet in the aggregate they are marketed by the thousands of tons and with a total value of many millions of dollars. Here may be a chance for some of our readers to get in on some of the big money if they have sources of the foregoing minerals in marketable quantities, available transportation and the initiative and know-how to get into the game of supplying abrasives to industry.

EARTH SCIENCE QUIZ NO. 3

Test your knowledge! How much do you know? How many of the following terms can you define? They are arranged in three groups with progressive difficulty. Group 1, things everybody should know;group 2, things good "rockhounds" should know; group 3, things which experts might be expected to know. Try your luck. To score—add up total points as indicated by the group number and rate as follows: 1-6 poor; 7-13 good; 14-20 excellent; 21 perfect.

(1) a. lignite	(1) e. galena	(2) i. core
(1) b. strata	(1) f. octahedron	(3) j. varve
(1) c. SiO_2	(2) g. magma	(3) k. $CaSO_4 2H_2O$
(1) d. loess	(2) h. serpentine	(3) l. Kieselguhr

Meteorites of Xiquipilco, Mexico

by Dr. H. H. Nininger, Director, American Meteorite Museum, Winslow, Ariz.

Photos by Nininger

Fields in the Village of Xiquipilco where some of the meteorites have been found.

ABSTRACT

The American Meteorite Museum, Winslow, Arizona, recently made an expedition to Xiquipilco with a view to clarify certain discrepancies in the literature and to further investigate this famous meteorite deposit. The objectives of the expedition are here listed and the results follow in the report.

Objectives:

1. To make a topographical reconnaissance of the meteorite strewn area.

2. To learn as much as possible regarding the locations of previous recoveries of meteorites.

3. To arrive at an estimate of the amount of meteoritic material previously recovered.

4. To recover additional meteorites together with accurate location data.

5. To test the accuracy of reports of large masses supposed to have been seen by some of the native Indians.

6. To ascertain whether traces of a meteorite crater or craters could be recognized either from the air or from the ground.

7. To apply a magnetic search for metallic spheroids such as have been found at the Arizona and the Texas craters.

8. To recover if possible some of the implements which in early days were manufactured from meteoritic iron.

9. To ascertain whether there is any justification for the confusion of names by which this fall has been designated by various writers, and if possible to present sufficient reasons for the adoption of a single name by which it shall be referred to in future publications.

One of the greatest deposits of meteoritic iron known on the earth is that on the western slope of the continental divide in the State of Mexico, about 30 miles northwest of the city of Mexico. In meteoritical literature this fall, of unknown date, has been referred to as Toluca, Xiquipilco, Ixtlahuaca, Tejupilco, Ocatitlan, Jiquipilco, Ziquipilco, and a few other names. The last two are merely variations in the spelling of Xiquipilco. The other appelations have been applied by scientists who received meteorites from villages bearing the respective names.

Naturally, where thousands of irons were found in a single village it was inevitable that some of them would be transported to surrounding villages or cities. Scientists of Europe or the United States received such specimens and studied them. In some cases, either through lack of familiarity with the Xiquipilco meteorite, which was described as early as 1827, (1) or inadequate study, perhaps due to a lack of sufficient material, it was decided that the specimen in hand belonged to an undescribed fall and was given the name of the village from which it had been received. In other cases writers concluded without proper investigation that the fall had encompassed a very wide area including several villages and therefore deemed the name of their particular village applicable.

A thorough, first-hand investigation into the distribution of this fall indicates that all of these synonyms were unjustified and that some are definitely misleading. Most unfortunate is the use of the term Toluca, which is the name of a considerable city some 30 miles from the meteorite location and is also the name of a broad, comparatively level valley. Xiquipilco, where the meteorites are found, is not in the valley but several hundred feet above it on the steep slope of the sierra that constitutes the continental divide in that part of Mexico.

As a matter of record most of the literature descriptive of this fall has appeared under the designation Xiquipilco or Jiquipilco (two spellings of the same name and pronounced heek' a peel"

Aerial view of the Xiquipilco area looking eastward

Normal activity in one of the Village streets of Xiquipilco.

ko), but for no good reason a few prominent writers used the designation Toluca and thus brought about its general use among American and English writers.

Humboldt, who was in Mexico in 1803-4, wrote in 1811 (2) that "meteoric iron" is found at several places in Mexico, "for example, at Zacatecas, Charcas, Durango, and, if I am not mistaken, in the vicinity of the small town of Toluca."

Later Berthier in 1827 (1) described a meteorite which he had obtained from Humboldt as having come from Toluca. The fact that Humboldt referred to Toluca as a small town [it has been recognized as an important city since 1677 (3)], and the further fact that he credited his information on meteorite locations to one Sonneschmidt (2), seems to justify the conclusion that he had no first hand information as to the actual source of the irons to which he referred as coming from Toluca. This indefinite location was doubtless passed along to Berthier with the specimen which the latter described.

Krantz, writing in 1857 (4), inexcusably adopted the same misleading designation. He refers to a search which he "conducted," made during the year of 1856 for meteorites in the Toluca region, a search which yielded 69 specimens. In this instance "in the Toluca region" evidently meant that the search was carried on by persons from Toluca through whom Krantz obtained his specimens, which specimens were doubtless purchased from the Xiquipilco Indians, as will shortly be made evident.

Wöhler in 1856 (5) likewise inaccurately used the name Toluca Valley in referring to these irons. He mentions the many perplexities and mistakes due to the use of the names of many villages from which meteorites had come, "most often Xiquipilco and Ixtlahuaca" and then strangely enough entitled his paper "Ueber das Meteoreisen von Toluca in Mexico." In this paper he credits Mr. G. A. Stein with obtaining the material described. But Stein's own report quoted by Wöhler makes very clear the fact that the source of the material had in all cases been the village of Xiquipilco and its immediate vicinity where he personally journeyed in 1854 to find their source, and actually stumbled over a mass of iron projecting from the ground.

Stein (6) stated that a blacksmith near Ixtlahuaca had for a long time manufactured implements from meteoritic iron, that the iron was purchased from the Indians who brought it to him from several different villages "although it is always from the same identical Jiquipilco."

Reichenbach (7) also applied the name Toluca Valley to this great fall, even though all the localities that he mentioned as sources are located in the sierra with the exception of Ixtlahuaca which is more than 12 miles west of where all of the meteorites were found, though it is true that many had been transported to that village where the iron was used for manufacturing implements.

Farrington, in his great "Catalog of Meteorites of North America," (8) adopts the name Toluca even though the majority of his references used make clear that the location was Xiquipilco. The application of this geographically misleading name in such important works as this, and that of Prior have been responsible for much of the present day misunderstanding relative to the pin-pointing of this most important fall.

Our recent survey not only failed to discover any reason for a duplication of names, but also indicated a rather limited extension of and very intensive distribution for the fragments of this fall. Using the village plaza of Xiquipilco as the center, meteorites have been found on all sides of it as well as within it, and probably all of the several thousand specimens recovered have been found within a radius of 2 miles. Certainly the vast majority were found within a radius of 1½ miles (2½ km.) of the plaza.

Historical

Alzate Ramírez, writing in 1831 (9), stated that from time immemorial the haciendas of Xiquipilco and vicinity had depended entirely on "native iron" found by the Xiquipilco Indians for all their tools and implements. Says Ramírez, "About the year 1776 I went to Xiquipilco to see with my own eyes the famed native iron. I found two smiths established in the town who worked the native iron, and in my sight they forged it and worked it into the shape demanded of them."

In "Gazetas de Mexico," 1784 (10), may be found first hand testimony to the truth of Ramírez' statements. Here again it is definitely stated that the meteorites were found by the Indians in the town of Xiquipilco as they worked their fields. For the benefit of those unfamiliar with the mountain villages of Mexico, I will explain that the population of some 2 or 3 thousand is spread out over an area of perhaps 9 square miles, their dwellings ranged along the tops of ridges and along water courses, while the hillsides between are cultivated as small fields, some of which actually adjoin the public square save for a single row of market stalls.

Mr. Wilhelm Stein, agent for a German-American mining company, reported in a letter to his company dated April 23, 1825: "Among the minerals which I send you there is a piece of iron from Jiquipilco, 10 leagues N.E. of Toluca. The occurrence of this iron deserves to be more closely investigated. As yet there is little or nothing known about it, and I was not permitted to clear up this uncertainty upon the occasion of my first trip to Jiquipilco, because I was not so fortunate, despite my painstaking search, as to find a piece of the questionable iron in its place of discovery: It is known, moreover, that a considerable quantity of this iron was found in plowing the ground in that vicinity, and that it was used to make all sorts of tools."

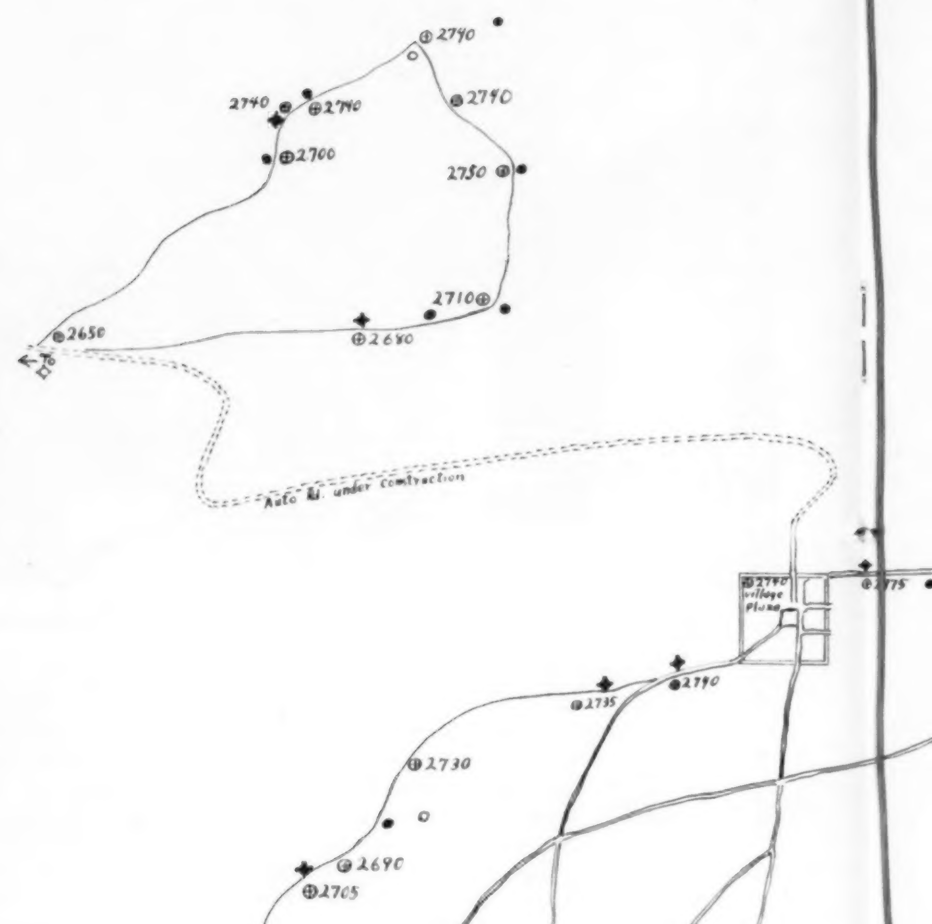
Burkart in 1856 (11) described the locality of the find as being at Xiquipilco and pointed out that the designation of Toluca, as used by some was incorrect. He also throws some light on the distribution of specimens of this

Dr. Mullerried making inquiry of the natives in Xiquipilco concerning meteorites.

fall, both natural and by human agencies. "While I was living in the neighborhood of Toluca, I was informed that specimens of meteoric iron were to be found at Toluca. But I found no such specimens there, and afterwards learned, while sojourning in the mountains of Zacatecas, that it was found in the vicinity of Xiquipilco and much used there. Despite all my efforts, however, it was no longer possible for me to obtain a piece of it. From the length of time during which iron from this source had been sought and utilized by individuals for their own needs, and from the number of specimens carried away for scientific collections; and from the fact that notwithstanding all this, new specimens are continually being found, among which have been secured masses of a few ounces weight up to several hundred weight, I conclude that the Xiquipilco iron must have originated from several aerolites of one and the same fall, rather than from one huge one, such as would have been necesary to furnish all the meteoric iron that has been obtained here.

"The Xiquipilco iron is found distributed over a considerable territory. G. A. Stein, who studied the region most recently, stated that they were scattered over a strip of territory almost 3 miles long, extending in the direction of northeast and southwest. They were found on the hills to the north and south of the town, sometimes in the loam of the hillside, and sometimes under the rubble of the ravines, where the water is so inconsiderable that it could not move the heavy meteoric iron masses. From this fact it is evident that such masses were found just where they fell.

"Whether the masses of meteoric iron designated by the name of Istlahuaca and Hocotitlan were actually found in the vicinity of these villages, or much more probably were found by Indians from that neighborhood while hunting at Xiquipilco and were brought back to their home town and then merely purchased by those at Istlahuaca and Hocotitlan I do not venture to decide, but I think the latter is the probable fact. If the before-mentioned masses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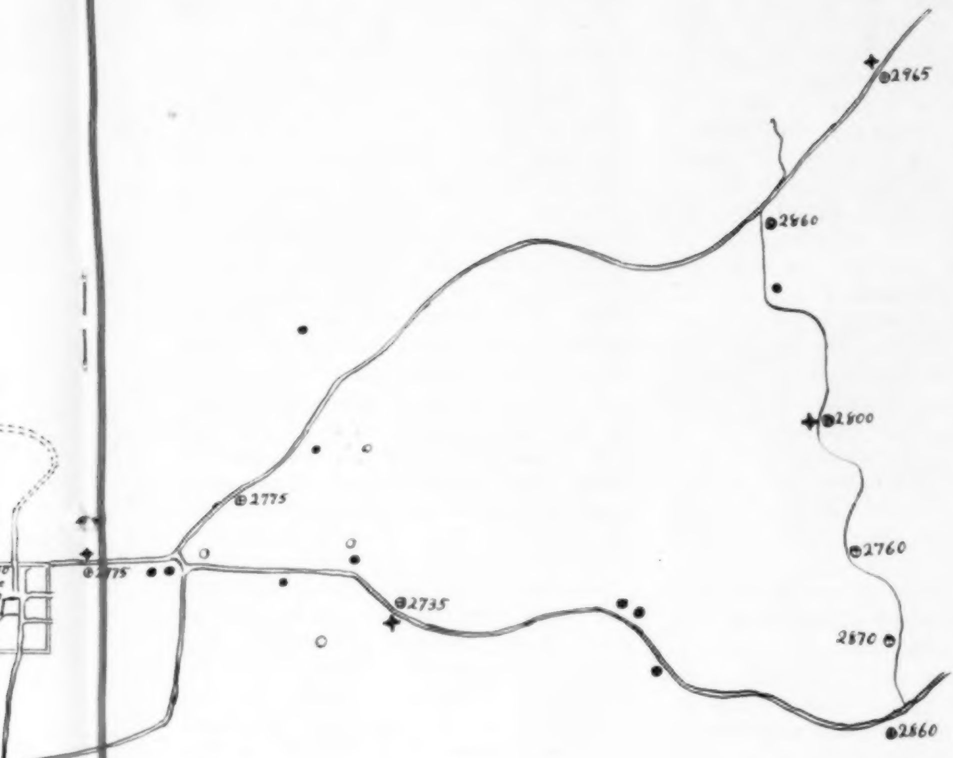


Sketch Map of

Xiauipilco Mexico Mexico

// Foot and burro paths followed by Nininger party
● Locations where meteorites were obtained 1952
○ Locations where meteorites were reported found, recent years.
✚ Magnetic samples taken
⊕ Elevation in meters

Scale ——— 500 meters

measurements by pedometer

F.K.G. Mullerried and H.H.Nininger

of meteoric iron and all those which have been found, wrought into utensils, and carried away from the neighborhood of Xiquipilco during the last 70 or 80 years all belong to one and the same aerolite, it must be one of the largest, if not the largest ever known."

Wöhler writing in 1856 (5) quotes G. A. Stein to the effect that he had not ventured to determine exactly the distance between the extremes of the meteorite field, but he was convinced that it was at least 2 leagues and probably more. This estimate was apparently later revised, for Burkart the same year wrote that Stein had studied the region most recently and stated that the irons were scattered for almost 3 miles in a direction of northwest and southwest. This is more in line with what Mullerried and Nininger were able to learn on their visits in 1929 and in 1952.

Krantz promoted a search in 1856 (4) and recovered 69 specimens with a total weight of 49.5 kgs.

Reichenbach in 1857 (7) wrote a report, referring to the search made by Krantz the previous year and also to collections made by Stein, Schleiden, Burkart and Ordoñez. He speaks of the irons being "scattered along for a mile or more."

During the last half of the 19th century many papers appeared dealing with the structure and composition of the Xiquipilco irons, but I find no record of further attempts either to delineate the area of dispersion, to map the distribution of irons, or to arrive at a proper estimate of the total weight of the fall.

Farrington (8) in his 1909 catalog, under the item of "weight," states: "Several hundred masses, some weighing as much as 150 kgs. (300 lbs.) each," but he makes no reference to the work of H. A. Ward, who is known to have been a most active collector and distributor of Xiquipilco meteorites during the latter part of last century.

During my 3 months stay in Mexico City in 1929, I made inquiry of Dr. José Aguilera, eminent geologist of the National University of Mexico for many years, who told me that Ward had made several trips to Mexico on which he made extensive purchases of the Xiquipilco irons. He also told of another American dealer whom I interpreted to be Dr. Foote. Both, he said, shipped out large quantities at different times. He volunteered the statement that he, Dr. Aguilera, could vouch for 22 tons of the meteorites being shipped out of Mexico previous to 1929. No efforts had been made to collect so far as he knew since about 1904, Ward's latest visit.

Carrying a letter from the proper officials in Mexico City, Dr. Mullerried and I visited Xiquipilco in December, 1929. We found that all of the residents of the village were familiar with the tradition that from time to time Americans came to buy the "aerolitos." Accordingly, the specimens had been put away when found, and as soon as word of our presence got around they began bringing them to the "casa del Presidente municipal" where we had established our headquarters. We came away with more than 700 lbs. of the irons, mostly small, but with several of 10 to 20 lbs. and one of 206 lbs.

Through reliable sources we have definite knowledge of 1400 lbs. of material being removed between January 1930 and January 1952. Some of this was purchased in Europe.

An 800-pound mass was on display in the Instituto Geología in 1929 which was said to have come from Xiquipilco. We cut a section from it which clearly bore out this report. No such mass or even one half as large had been recorded in any of the literature to my knowledge.

All of these facts would seem to render quite possible the correctness of Dr. Aguilera's statement that 22 tons had been removed previous to December 1929.

It would be difficult to estimate the amount that may have been worked up by the blacksmiths of Xiquipilco and Ixtlahuaca during the generations previous to 1776 when Ramírez first saw them in action. Fifty-five years later Ramírez wrote that "from time immemorial no artificial iron has found its way into Xiquipilco," but that they still depended on the natural iron for all of their tools. One is led to wonder if this may have been the greatest deposit of meteoritic iron known on the earth.

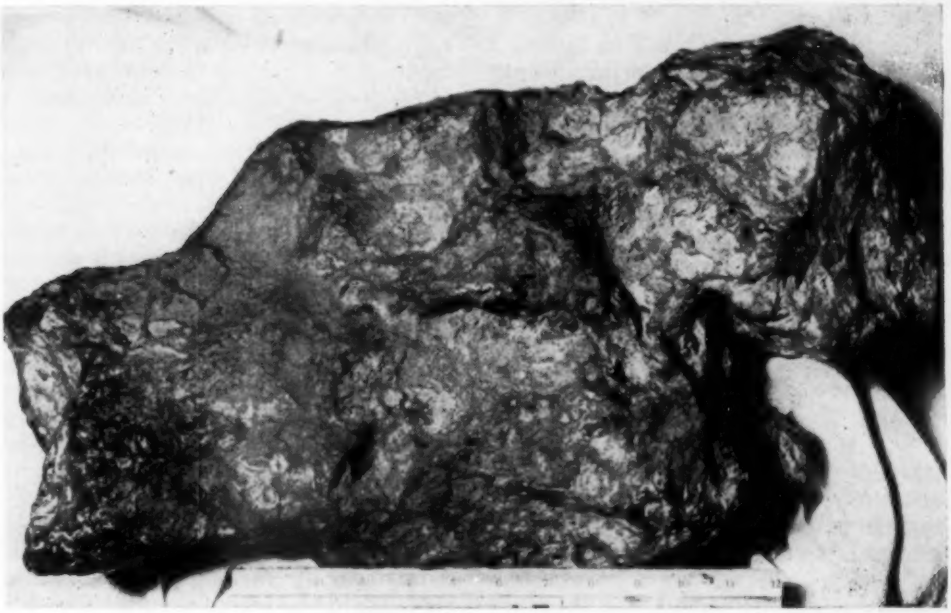
Our visit in 1952 resulted in the recovery of 63 individuals with a total weight of over 400 lbs. Thus it seems that the area is still yielding the celestial fruit, even though at a somewhat slower pace. On this last occasion we made a special effort to elicit information as to the bounds of the meteorite bearing area. Men of 80 years as well as the younger generation were unanimous in their statements that the area is very restricted and those questioned in outlying points were prompt to tell us that in Xiquipilco was where the "aerolitos" were found. We spent two days walking among the dwellings and making inquiry, covering a distance of 4 miles in a northeast-southwest direction and about a mile to the north, east, and south. Besides these excursions we talked to the population generally in the market center. We became convinced that the strewn area is quite restricted and conforms generally to the bounds of the village with its center about where the village plaza is. We found evidence of greater intensity in the northeast-southwest axis and also believe the irons have been more numerous in the northeastern portion than southwest.

Geology

The entire area is volcanic. Numerous remnants of volcanic craters are evident to the east, southeast and northeast, and to some extent on the north. Hundreds of small fields are cultivated on the inner and outer slopes of long extinct volcanoes. Many of these fields are so steep that the corn rows are like stair steps and the incline is often steeper than many staircases.

Dr. Mullerreid considers the volcanic rocks and tuffs to be mainly of Tertiary age with some also of Quaternary. The only sediments are of Pleistocene and Recent deposits.

We looked in vain for any remnants



Xiquipilco meteorite, Weight 206 pounds.

of what might be considered a meteorite crater, but if any were there we failed to make the identification. All appeared to have the characteristics of volcanic rather than impact craters.

All references to this as being located in the Toluca Valley are misleading. In the broadest use of the term one might of course speak of everything from the crest of the sierra as being a part of the valley since its drainage is into the streams which drain the valley. But here the sierra rises very abruptly from the valley floor which is comparatively level. Burkart recognized the inappropriateness of the name "Toluca Valley" for the meteorite stating that Xiquipilco was the proper designation, yet described it as being situated on a plateau of the Cordillero of Mexico. But this too is incorrect. Instead of being on a plateau the town is built on a series of narrow ridges which lead down from the crest of the sierra. The very steep sides of these ridges slope down to small streams, and if these slopes were not in cultivation one would probably refer to the stream courses as being ravines rather than valleys.

The Search for Implements

In 1929 I had succeeded in finding a single implement manufactured from meteoritic iron (12), and we had hoped to discover more on the recent expedition. We continually kept on the alert when tools or implements were in sight, but all were evidently of artificial steel.

We had planned to carry on this search through the local blacksmith, but fate seemed to be against us. Xiquipilco is by no means a cultured community. I have not seen, in all of my travels in Mexico, a village that seemed to have absorbed less of civilization. Life is rugged there. And so it was that a murdered man was carried into the office of the "Presidente" about the time we arrived; and it turned out that the blacksmith who was prominent on our list of persons to be visited was not to be interviewed. He it was who had committed the murder. We thought it best that strange people should not be showing too much interest in him on this particular occasion.

The Search for Metallic Spheroids

Since finding the nickel-bearing metallic spheroids (13) in connection with the Arizona and Texas craters, we have regarded a search for these as a very important part of any survey where large meteorites may have fallen. Consequently, even though we were unable to discover any stratigraphic deformity that could be interpreted as crater remnants, we took a number of magnetic samples from various locations in the Xiquipilco community.

When these were sorted there appeared a considerable number of particles which resembled the spheroids with which we are now familiar here at the Barringer Crater, except that those from Xiquipilco appear lighter in color. However, when they were tested for nickel the results were negative. We are therefore unable to ascribe to them a meteoritic source. It is considered possible that meteoritic spheroids may eventually lose their nickel content while yet retaining their spheroidal form, because tests on oxides (14) from nickel-iron meteorites have shown that nickel leaches out of these oxides. The spheroids with which we have dealt so far have been metallic and consequently retain their nickel content, but we have theorized that non-nickeliferous forms may also exist.

The Xiquipilco meteorites are less well preserved than those from the Barringer Crater area, which may indicate an older fall. It is therefore possible that the particles which we collected are actually altered spheroids, but if so there is as yet no known method of positive identification. We are forced, therefore, to report negative results or at least no positive results in this part of our search.

I should also mention that we flew over the area in a search for evidence of any possible craters. Here again we must report negative results. We saw what we thought might prove to be a meteorite crater, but when it was viewed at ground level its volcanic origin was established. An aerial search had been suggested in 1937, and Dr. Mullerried had made a flight shortly thereafter. He was impressed with the need for a thorough ground investigation, but the objects which puzzled him also turned out to be badly eroded volcanic craters.

Widmanstatten figures in a typical Xiquipilco meteorite.

Summarizing, we may say that the evidence for the former existence of a meteorite crater at Xiquipilco is only circumstantial and by no means convincing since the 1952 survey. The facts which seemed to suggest its probable existence were: 1. The very exceptional abundance of meteoritic irons in the vicinity. No comparable number of siderite individuals have been found anywhere in the world apart from meteorite craters, and four crater locations have shown such concentrations, namely, Barringer Crater, in Arizona; Odessa Craters, in Texas; Henbury Craters, in Australia; and the Novopokrovka Craters, in Siberia. The Haviland Kansas Crater was accompanied by a similar concentration, but these were mainly pallasite instead of siderite individuals. 2. There had been

An implement known as a barretta, forged from a meteorite in the Village of Xiquipilco. For use, a handle is inserted in the sleeve at the top and the tool is used much as we use a crowbar.

found among the Xiquipilco irons a few which on being etched showed deformed kamacite plates, and some which showed alteration from heat, yet their exteriors showed no evidence whatever of artificial heating or forging. 3. Small ferrous granules were collected magnetically, which externally closely resembled the metallic spheroids which are known to be meteoritic.

The evidences against a crater-forming impact are: 1. No stratigraphic deformations assignable to such a force were found. 2. The spheroid-like granules found lack nickel content. 3. The distribution of irons shows a tendency to be elliptical rather than circular. 4. No radial or zonal distribution as to size has been noted among the irons.

Even in the face of these negative results it is possible that a crater has existed, but that all traces of it have been removed by the excessive erosion that characterized the region. The spheroids could have oxidized and their nickel contents have been leached away. The lack of any zonal or radial distribution of fragments being noted could be due to the generations of collecting before scientific studies were made.

Therefore the question is still an open one.

Do Large Masses Exist?

Here again our results were negative but not final. The man by whom the report had been made, and who claimed to have seen a mass of a ton or more, had died before our visit in 1952. We were unable to locate any other witness. Less positive reports of a second large mass were obtained, but here again no one was found to guide us to the location. The 800-pound mass in the Instituto Geología is evidence that the published maximum size is much too small. Also the fact that a mass of some 400 lbs. is known to have been sent to Europe only a few years ago tends to give credence to the stories of larger masses. But this, too, can be settled only by further investigations.

The expedition here recorded was sponsored by the University of Arizona and financed out of the Stuart H. Perry Research Fund.

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STUPENDOUS

Water being a universal solvent, the oceans are in fact the earth's great storehouse of minerals of all kinds. It is said that more than 30,000 tons of radium are dissolved in ocean waters, and what seems even more unbelievable, the oceans contain enough pure gold to pave the entire United Sates or to form a canopy over the entire world.

Furthermore, it has been said by those who have a flare for computation, that if one were to extract all of the gold from all the waters of the oceans there would be sufficient to make a millionare of every man, woman, and child on earth. Will some one get busy, please?

* * *

The Changing History of the Insects by B. Smith — in the January issue.

The Role of Vertebrate Paleontology in Petroleum Exploration

by R. A. Stirton
University of California

The misconception that Vertebrate Paleontology is primarily a study in morphology and evolution, and hence is of little use in stratigraphy and correlation seems to still prevail in the minds of many geologists. Perhaps this might be expected since the founder of modern Vertebrate Paleontology, Georges Cuvier (1769-1832) established the science on the basis of a comparative morphology in Recent animals. Furthermore he believed that each succeeding fauna, where he found it imbedded in the rocks, had died out and was buried perhaps by some catastrophic event before the next series of rocks was laid down, then a new fauna was created. Though not sharing Cuvier's ideas on catastrophism, vertebrate paleontologists of the later part of the nineteenth century in their haste to discover new and interesting fossils did little to strengthen our reputation in the field of stratigraphy.

On the other hand Invertebrate Paleontology has been thought of as the tool of stratigraphers. This undoubtedly was greatly influenced by the thinking of Charles Lyell (1797-1875) and Paul G. Deshayes (1796-1896) in drawing up their Tertiary time table based on the percentage of living marine invertebrate forms represented in their Tertiary formations. This method was eminently successful in pioneering correlation but is now nearly abandoned.

Nevertheless, vertebrate paleontologists are now using their knowledge of vertebrates in correlations of stage refinement, and in certain areas early and late divisions of a stage are determined. This is possible because vertebrates, and mammals in particular, evolved rapidly and dispersed widely, even to adjacent continents in a relatively short time. Then, too, the phyletic sequences of many groups are well known, and phyletic control and stage in evolution have become accurate methods in correlation. Skeletons are not necessary, frequently one or more teeth will suffice in making age determinations. Detailed evolution in mammals is better understood than in any class of organisms. The evolution of the horse is the best example of almost imperceptible intergradation in evolution from early Eocene to the Pleistocene. Representatives of other families, also, are nearly as well known, as exemplified in the beavers, dogs, rhinoceroses, camels, antilocaprids and many others. Taking the evidence from the faunal assemblages as a whole, then, accurate data are available for establishing synchrony in geological and biological events locally, regionally and even on different continents.

During the past few years the University of California has conducted some rather inexpensive expeditions to Colombia, South America, where we have dated late Eocene, early and late Oligocene, late Miocene and Pleistocene beds. These correlations have been made with the continental sequence in Argentina. Our knowledge is now sufficient to establish stage refinement in the land laid beds in northern South America and with continued exploration this kind of correlation can be extended throughout the continent.

One tie-in with marine beds has been made and this can be done in many other areas along the Caribbean Coast. Every effort is being made with our limited funds to carry out detailed stratigraphic studies in the areas where fossils have been found. These include thickness of sections, sources of materials, orogenies, nature of deposition and paleocology.

There are many thousands of feet of continental beds representing every epoch of the Cenozoic along the Andes from Venezuela to Argentina. In many places these sedimentaries overlie possible reservoirs of petroleum. During the past twenty years millions of dollars have been spent on different aspects of research and on field geology in search for new oil fields, yet one of the most effective tools in correlation, Vertebrate Paleontology, has been almost totally neglected. Perhaps this is because vertebrate remains are usually more difficult to locate in the field than are invertebrates, but trained field men find them as demonstrated by our work in Colombia. It is true that some beds are almost totally devoid of fossil remains but this is true of both continental and marine beds.

Perhaps hearsay has prejudiced the use of Vertebrate Paleontology as an important source of information in petroleum exploration.

A. G. I. News Letter 12-51

Big Chief Mountain, Glacier Natl. Pk.

by Geo. Reichert

Geol. Soc. of Minn. and Minn. Mineral Club,
3246 N. Humboldt Ave., Minneapolis 12, Minn.

I was born about 2 billion years ago in what was the bowels of the Earth, way back in the Algonkian period. For many thousands of years the sea was my cradle and I was covered with millions of tons of sediments eroded from older mountains and transported and deposited by many streams emptying into the Algonkian seas. Later I was consolidated and hardened by pressure and heat from the interior of the earth. Then many thousands of feet of sediments were deposited on top of me and hardened into shale or Argillite, and some limestone was deposited on top of that, many millions of years ago.

Then one day a terrible convulsion or revolution shook the earth and I was hoisted up, up, up, for thousands of feet and pushed out over the younger Cretaceous plains of Montana 15 miles to form a new range of mountains—the Lewis Overthrust. Then I was crumbled, faulted and folded so that erosion wore away thousands of feet of my head and body, leaving me but a remnant of the former lofty, inspiring, towering, rocky, Altyn limestone mountain that I was.

About 12,000 years ago the great continental ice sheet, coming down from the north like the Huns, swarmed all around me like a pack of hungry wolves and plucked great gaping holes in my sides and ground over my limestone sides and polished my slopes in places, leaving behind the great glacial striae, like scratches from the claws or fangs of giant carnivores. But I survived all this pushing and pulling and geological mayhem for thousands of years.

Altho I am still very hard and durable, erosion will eventually reduce me to the level of the younger Cretaceous plains of Montana. That will be the end of me as a mountain and I shall go to the Happy Hunting Grounds of my illustrious ancestors, to make more ocean sediments which will go thru the same process of evolution that I did—erosion, transportation, deposition, consolidation, and possibly elevation again.

Today I am BIG CHIEF Mt. But tomorrow, many millions of years hence, I may be only a small butte or ant hill or a peneplain or ocean sediments; who knows?

But today I am Big Chief Mt. and many tourists come from all over the world to view my beautiful rugged, towering Altyn limestone body — one of the greatest geological phenomena of the world. Towering above the relatively young Cretaceous plains of Montana at Glacier Park, trying to defy the elements, because of my durability, I am STILL

BIG CHIEF MOUNTAIN.

* * *

A hobby on the long arm of the scale keeps things in balance.—W

Studies in Coal

II—THE FORMATION OF COAL

by Dr. F. L. Fleener

N. S. Shaler once wrote: "Although every year our forests drop tons of leaves, twigs, branches, and even trunks of trees, no coal is formed." Decay in the presence of air is largely one of oxidation, in which the substance of the vegetation is transformed into gases, for the most part, and given off into the air. However, if vegetation falls into water, where the manner of decay is entirely if not essentially different, a large part of the material is retained, though in altered form. Material which undergoes decay under the water of a swamp goes through a deoxygenating and dehydrogenating process, which results from fermentation, during which the plant tissues are attacked by insects, worms, amoeboids, fungi and bacteria. Of these the anerobic bacteria are the most important in the formation of a dark, pasty substance, which at length emerges into the form of vegetable material called PEAT. This has been designated as the putrefaction stage, which is almost entirely a biochemical process.

In the second stage, which is an alteration or metamorphic stage, we see the result of dynamic influences in the compacting of the material into the different *forma* of coal. It is now known that coal formation is not altogether due to pressure, but in a large measure the process is influenced by the manner and rapidity of the escaping gases that are the result of the fermentation of the material; if these gases are allowed to escape freely through cracks or by the porous nature

Culm piles southwest from Wilmington, Illinois, where thousands upon thousands of the fern nodules were turned up during the coal-stripping operation. This would indicate an along-shore swampy condition during the Pennsylvanian Period. — Photo by Lawrence Schuck.

of the cover, and some oxygen is permitted to have access to the material, we will note a rapid transformation and a coal with a high carbon content; but if the gases are given off slowly, there will be but a slow change through all the intermediate steps in the process of coal formation.

Then, too, it is known that all along the line from vegetable matter to coal the material is constantly losing in volume and weight; a foot of rough peat shrinks to one and a third inches, and by certain involved computations we find that some of our coal seams must have taken over 100,000 years in forming. N. H. Winchell, that grand old man who did so much to popularize geology last century, in his little book "Geological Sketches," discusses this topic thus: "The amount of vegetable matter in a single coal seam six inches thick is greater than the most luxuriant vegetation of the present day would furnish in 1,200 years. Boussingault calculated that luxuriant vegetation of the present day takes from the atmosphere about a half ton of carbon per acre annually, or fifty tons per acre in a century. Fifty tons of coal, spread evenly over an acre of surface would make a layer of less than one-third of an inch. But, suppose it to be a half inch, then the time required for the accumulation of a seam of coal three feet thick — the thinnest that can be worked to advantage — would be 7,200 years. If the aggregate thickness of all the seams of coal in any basin amounts to sixty feet, the time required for its accumulation would be something like 144,000 years. In the coal measures of Nova Scotia are seventy-six seams of coal, of which one is twenty-two feet thick, and another thirty-seven inches."

An Earth Science group with the Braidwood Fossil Beds as a backdrop

Coal seams are of varying thickness and extent; most seams vary rapidly in thickness from place to place, governed by the undulations of the floor of the ancient swamp. The Pittsburgh seam, however, is probably the most

Dr. Fleener explains Coal Formation to an Earth Science group

remarkable exception to this rule. This exceptional seam has been traced over an area of more than 2,100 square miles, with an average thickness of over seven feet. Its total area has been estimated at about 30,000 square miles. Then again, some coal seams cover only small areas, in which case the extent is limited by the border of the swamp in which they were laid down.

The thickness of coal seams is also quite variable, being dependent upon the length of time in which the accumulation of vegetable matter went on without any serious interruption. For instance, in Kingston, Pennsylvania, there is a bed of anthracite twelve feet thick, that must have involved an enormous amount of vegetation, and of time, a period which, if expressed in years, would be almost infinite, as compared with the epochs of human history. Someone with a penchant for mathematics, has computed that it would require a depth of eight feet of compact vegetable matter to form one foot of bituminous coal, and twelve feet to form one foot of anthracite.

A few coal seams are of enormous thickness. E. S. Moore, in his book, COAL, cites some interesting examples: "At Morwell, Victoria, Australia, there are three seams of brown coal (Lignite) which are 266, 227, and 166 feet thick respectively. They are the thickest so far known in the world. A drill hole 1010 feet deep, put down in the area, passed through 780 feet of coal." Other notable beds are the Grande Couche of Commentry, Central France, which is 60 feet thick, and, near Gillette, Wyoming, there is a bed of lignite 90 feet thick. Also, the Mammoth seam of the anthracite region of Pennsylvania, in the Southern Field is 50 feet thick. In nearly every instance, these phenomenally-thick beds of carbonaceous material are found to be associated with orogenic movements of the earth's crust, which squeezed the carbonaceous material into large masses.

(*Continued in early issue*)

LOWLY GYPSUM IS AN IMPORTANT MINERAL!

On occasion of the half century mark being reached by the U. S. Gypsum Company, some interesting facts dealing with the subject were recently released for publication.

Chemists call it hydrous calcium sulphate ($CaSO_4H_2O$) and the rest of us know it as gypsum, but there are scores of uses for this mineral outside the building and construction field with which it is usually identified.

Small quantities, for example, provide a mild abrasive in tooth paste (gypsum is even used in beer!) and large quantities go into the mock-ups for massive airplane fuselages.

The officials dug into the history of gypsum and found that the body of legendary King Tut was supposedly encased in gypsum plaster; that Roman law, at the height of the empire's glory, required the use of gypsum to fireproof dwellings; that gypsum was even used in bedding the blocks of the Egyptian pyramids.

All this was by way of pointing up gypsum's modern and extensive use in the home and in industrial construction —in the form of plaster, partition tile, gypsum board used both as a base for plaster and in dry wall construction, as acoustical plaster and as acoustical tile.

Instead of retrenching during the depression of the 1930's, the company diversified its business with the manufacture of metal lath and expanded metal products, wood fiber insulation board and hardboard, resin-emulsion paints, asphalt roofing, mineral wool insulation, and asbestos cement siding. Another expansion was begun after World War II to meet the vast, accumulated demands for new housing.

The company, 50 years after its establishment, now operates diversified facilities at 46 separate plant sites around the country, a fleet of ocean going vessels, extensive laboratory facilities, 61,000 acres of mineral lands, and more than 88,000 acres of timber land for pulp wood, all directed from headquarters in Chicago.

One of the most significant developments in the wider use of gypsum coincided with the company's beginning—the discovery of methods to control the "set" of the mineral, then more commonly known as "Plaster of Paris." Before that, it hardened so fast that plasterers were able to use it only with the utmost skill and care.

Retarders employed now control the setting time so well, that it can be worked with ease and care under predetermined situations, which greatly adds to its usefulness.

Calcium sulphate also occurs in the anhydrite (without water) form, and in many beautiful and attractive varieties widely distributed throughout the world. Alabaster, selenite, satin spar are common species which will add greatly to the interest of any collection of minerals. Many good specimens may often be found or purchased at very reasonable cost from dealers.

* * * * * *

Answers: Test your knowledge. Check ones which you have answered correctly.

(1) a. Brown (or woody) coal. A form intermediate between peat and bituminous coal.
(1) b. Individual layers of bed-rock, usually of sedimentary origin.
(1) c. The chemical formula for silicon dioxide (quartz).
(1) d. Wind-blown deposits of fine dust (aeolian soil).
(1) e. The common ore of lead (lead sulphide).
(1) f. A solid form (crystal) bounded by eight regular faces.
(2) g. A mass of molten rock of natural (volcanic) origin inclosed within the earth.
(2) h. A hydrous magnesium silicate often employed as an ornamental building stone.
(2) i. A cylindrical section (or sample) or rock cut in drilling operation on a prospect.
(3) j. Fine bedding planes in clays, shales, etc., showing seasonal or other variations in deposition.
(3) k. Chemical formula for hydrated calcium sulphate (gypsum).
(3) l. German name for diatomaceous earth, also in more or less general use in this country.

Total—Score: 1-6 poor; 7-13 good; 14-20 excellent; 21 perfect.

THE CONVENTION OF THE NORTHWEST FEDERATION OF MINERALOGICAL SOCIETIES AT CALDWELL, IDAHO, AUGUST 23-24-25, 1952

Reported by DON MAJOR, Tenino, Washington

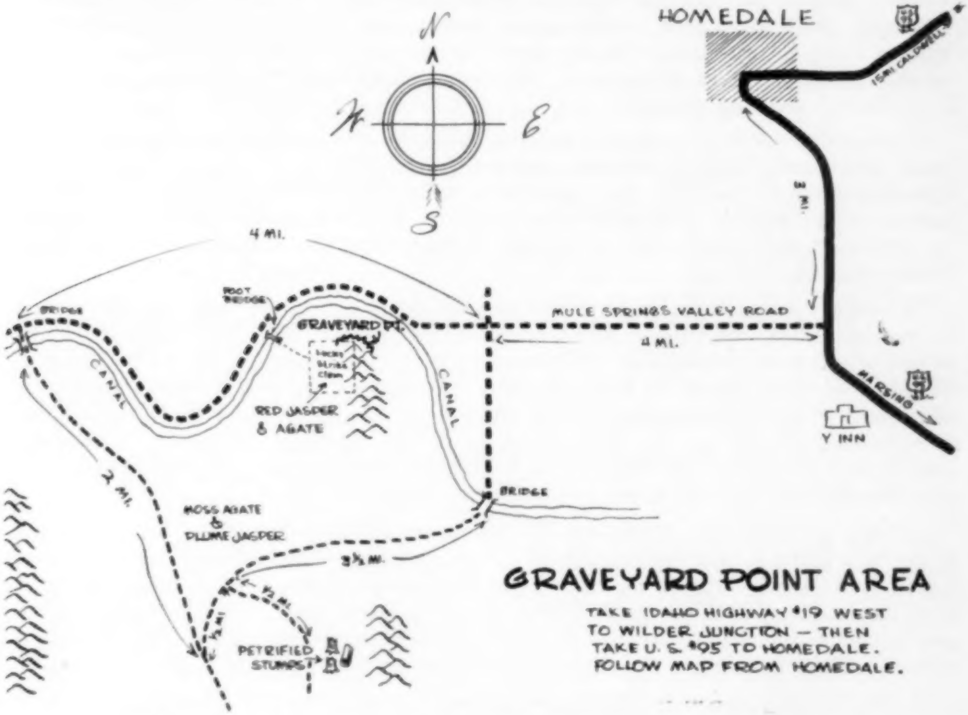
The 11th annual convention of the Northwest Federation of Mineralogical Societies was held August 23, 24 and 25 at the College of Idaho, Caldwell, Idaho. Attendance was estimated at about 3500, most of the 66 clubs of the Federation being represented. Outstanding displays of agate, petrified wood, fossils and minerals were to be seen, together with commercial booths from California and Northwest dealers.

Paul Brannan of Spokane, Washington, was elected president of the Federation and Mrs. A. W. Hancock of Portland, vice president. Mrs. Roger Bale of 2099 Riverview St., Eugene, Oregon, was named secretary and Mrs. Verda Runyan of Tacoma, treasurer.

Earl M. VanDeventer, the retiring president, had charge of arrangements, assisted by the members of the Owhyee Gem and Mineral Society, the host club. Lectures on "The Gel Theory of Agate Formation" by Professor J. H. Roblyer and "Western Indians" by Dr. Lyle M. Stanford were enjoyed. A Buckaroo Supper in chuck-wagon style took the place of the annual banquet.

Field trips to Beacon Hill and Graveyard Point, west of Caldwell, yielded moss agate, plume jasper and petrified wood, while mineral specimens were located on the old mine dumps at the ghost town of Silver City to the south.

The convention will be held at Portland, Oregon next year.



Most of us did not have the opportunity to attend this meeting "way out in Idaho' but some of us do get out that way once in awhile. It seems fitting that this chart, outlining the convention's field trip, should be reproduced here. Take his November issue with you on next summer's vacation trip.

THE SECOND ANNUAL CONVENTION OF THE EASTERN FEDERATION OF MINERALOGICAL AND LAPIDARY SOCIETIES AT NEWARK, N.J., OCTOBER 9, 10 AND 11

Reported by R. P. MAC FALL, Staff Member

The Eastern Federation of Mineralogical and Lapidary societies put all its youthful vigor into a highly successful convention held at Essex House in Newark, N. J., on Oct. 9, 10 and 11, closing with a field trip to the famous Franklin mine dumps at Franklin, N. J., on Sunday, Oct. 12.

More than a score of dealers and most of the fifteen member societies had exhibits. Among the outstanding exhibits—and it should be said that the average quality of the society and individual exhibits was the highest this reporter has ever seen at a mineral show—were the gem stones by Victor Pribil of the Queens Mineral society; minerals of Prospect Park, N. J. shown by the North Jersey Mineralogical society; the faceted and cabochon gem stones cut by Commander J. Sinkankas of the Lapidary Club of Washington, D. C.; the Korean and Illinois minerals displayed by Col. J. J. Livingston of the Mineralogical Society of the District of Columbia; and the mineral display of the Newark Mineralogical society. Others of high quality were jewelry shown by the Gem Cutters Guild of Baltimore; minerals shown by the Mineralogical Society of the District of Columbia; minerals belonging to Edwin Skidmore; Herkimer diamonds shown by Donal Hurley of Little Falls, N. Y.; jewelry and stones shown by Mr. and Mrs. Graham Rendell and by other members of the North Jersey society; Franklin minerals shown by the Nutley, N. J. mineralogical society; minerals displayed by the Syracuse mineral club; cut stones and jewelry from the Newark Lapidary club; gem stones cut by the Lapidary club of Washington, and an unusually varied display from the Miami, Fla., Mineral and Gem society.

Lectures, which were well attended and above the average in instruction value were made by Lelande Quick on "The Second Stone Age"; by Dr. Frederick Pough on "Ye Compleat Mineral Cabinet"; by Commander Sinkankas on "Crystal Structure and its Effects on the Process of Gem Cutting"; and Dr. Victor B. Meen on "Chubb Crater." Dr. Meen's paper on Chubb Crater was a feature of the July issue of the Earth Science Digest.

A banquet and installation of officers completed the convention business. The success of the convention was very evidentially due to two factors: the excellent work of the committee and the enthusiasm of mineral collectors and gem cutters from Maine to Florida who were present in large numbers. Perhaps no convention which this writer has attended was so permeated by a friendly spirit. Small knots of conversationalists were always present on the floor, breaking up and shifting constantly. A common remark was that collectors found at the convention many persons they had traded with or known by mail but had never met before in person.

Albert S. White was convention chairman, and William B. Aitken was also very active in making arrangements. Others taking an active part under the presidency of Harry L. Woodruff were Edwin Bemis, Warren Duncan, Grace Shaw, Philip L. S. Lum, Mrs. Lucy Dalla Valle, Wesley H. Hayes, Louis E. Shaw, Gene Vitali, Forester Newick and Louise Borgstrom, as well as Secretary B. J. Chromy, Treasurer J. H. Benn and Historian French Morgan. Mr. Aitken was elected president for the coming year.

A number of collectors from as far away as California and Arizona, as well as several from the middle west, were renewing friendships and making new friends on the convention floor.

* * * * * *

Midwest Federation Bulletin

Edited by Bernice Wienrank, Staff Member

AKRON MINERAL SOCIETY announces that it will exhibit gems and minerals once a year at the Akron (Ohio) Museum. The next exhibit will be held in April.

Time is set aside at each AMC meeting for showing bragging pieces, talking rocks, etc.

CHICAGO LAPIDARY CLUB invites members of the Midwest Federation to attend its annual open house meeting on Dec. 4. An attraction will be the club's unusual cabochon Christmas tree. Decorated entirely with gems and fluorescent materials . . . the tree will be alternately flooded by black and white light. Guest speaker for the evening will be announced later.

The meeting, which begins at 8:00 P.M., will be held at the Grand Crossing Field House, 76th and Ingleside, Chicago, Ill.

On Oct. 2, CLC enjoyed an illustrated lecture on "Shells, Stones and Silver," by Mr. and Mrs. Clell Brentlinger.

CHICAGO ROCKS AND MINERALS SOCIETY on Dec. 13 will hear Dr. R. W. Karpinski, head of the Geology Department of the Navy Pier branch of the University of Illinois, speak on "Geological Experiences." Dr. Karpinski, who has traveled widely, will base his talk on his own experiences, which are varied and interesting.

On Oct. 12 CR&MS was host to three other Chicago clubs. The occasion was a field trip to the Mazon Creek area in Will county, Ill. This area is an excellent source of plant fossils which have been exposed by surface coal mining.

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS attracted more than 1000 visitors to its display room at the Downers Grove Fall Festival, held Aug. 31. It featured displays on paleontology, archeology, mineralogy and lapidary, as well as two working exhibits of gem cutting and silver working. An encouraging result of the project was the large number of visitors who subsequently attended ESCONI's Sept. 12 meeting.

CENTRAL IOWA MINERAL SOCIETY was to hear on Oct. 3, Sgt. and Mrs. Auchard of Ames, Iowa, tell about their recent 10,000 mile trip through the Western states.

To encourage the development of young rockhounds, CIMS members give lectures on rocks and minerals to local schools and present the students with mineral specimens to start their collections.

CINCINNATI MINERAL SOCIETY is compiling a catalogue of mineral and fossil collecting areas near Cincinnati, Ohio. Rockhounds contemplating hunting in that vicinity are urged to contact CMS president, Charles L. Gschwind, 6931 Diana Drive, Cincinnati, Ohio, who will recommend collecting areas. Please state the kind of minerals or fossils that you wish to collect.

GEODE ROCKS AND MINERALS SOCIETY viewed the following films at their Aug. 22 meeting: "The Earth's Rocky Crust," "Ground Water," "Limestone Caverns," and "Yosemite, the End of the Rainbow." Displays of fossils and minerals were made by Mrs. Frank Krogmeir and Gerald R. Jones.

MARQUETTE GEOLOGICAL ASSOCIATION is scheduled to hear Mr. H. R. Straight of Adel, Iowa, speak on "Identification of Fossil Woods" at its Dec. 6 meeting. Mr. Straight, who is a past president of the Midwest Federation, is an authority on the subject.

At the opening meeting MGA president Kenneth Russell and Thomas Scanlon, president of the American Federation of Mineralogical Societies, gave a joint talk on the work being done by the American and Regional Federations. Popular Ken Russell was also the featured speaker at the opening meetings of both the Chicago Lapidary Club and the Chicago Rocks and Minerals Society.

MICHIGAN MINERALOGICAL SOCIETY members on Sept. 8 were shown 600 feet of film treating points of interest in Michigan as well as some of the club's activities. The film was prepared by member Floyd Mortenson.

MINNESOTA MINERAL CLUB was scheduled for Oct. 25 to hear Mrs. Gladys Hannaford, U. S. representative of the De Beers diamond syndicate, speak on "Diamonds and Diamond Mining in Africa." Mrs. Hannaford, who has spent much time in western Africa and South Africa, is familiar with all phases of the industry.

A recent field trip to Royalton, Minn., netted many MMC members lovely fairy crosses (staurolite formations).

NORTHWESTERN MICHIGAN MINERAL CLUB has set up its new meeting place in the Moulton Radio Shop, just outside Traverse City, with both lapidary and silver-working equipment. The club is starting a new membership drive aimed at an active rather than a large membership.

OSHKOSH GEOLOGICAL SOCIETY recently entertained the Wisconsin Geological Society with a field trip to the Lutz quarry near Oshkosh, Wis. Rainbow-hued pyrite and marcasite in the quarry act as magnets to Badger rockhounds. Occurring as cubes, flakes and needles, they are much more colorful than the variety found in the Ives quarry near Racine, Wis.

SHAWNEE GEOLOGY AND ROCKHOUND CLUB (Topeka, Kan.) had a field day and basket lunch in the Garfield Park at Topeka on Sept. 14. One hundred members and guests from the Independence, Kansas City, and St. Joseph, Mo. clubs and the Wichita and Lawrence, Kan., clubs participated. Mr. A. C. Carpenter, dean of Midwestern rockhounds was the featured speaker. There were also displays of rocks and minerals.

It is hoped this will become an annual event.

WISCONSIN GEOLOGICAL ASSOCIATION dubbed its first meeting of the season "Roundup Time." Members brought their best finds of the summer to the meeting and related their vacation experiences.

To encourage young members to contribute to its bulletin, the *Trilobite*, the group is presenting a trophy award to the junior member who submits the best article during the year. The trophy: a china dog flushing a real trilobite fossil.

SOUTHERN CALIFORNIA LAPIDARY ASSOCIATION announces that its 1953 Gem and Lapidary Show will be held at the Long Beach Auditorium, Long Beach, Calif., on Aug. 14, 15 and 16. Some of the foremost collections of stones and jewelry on the West Coast will be displayed. There will also be continuous demonstrations of cutting and polishing.

SANTA FE GEM AND MINERAL SOCIETY held its first rock and mineral exhibit Sept. 16 at the Chamber of Commerce rooms, Santa Fe, New Mexico. Only local members exhibited. Displays were outstanding, the more so considering that most members were new recruits to the rock collecting hobby when the club was organized in Feb., 1950.

YE OLD TIMERS' CLUB held meetings at Canon City, Colo., St. Paul, Minn., and Caldwell, Idaho, during the summer. A membership drive, started at Canon City, netted 46 members during July—very good for one month. Sixty is minimum age for joining the club.

Groups not associated with the Midwest Federation are urged to send reports of their activities to this department, c/o Bernice Wienrank, 5345 *Harper Ave., Chicago* 15, *Ill.*

THE EARTH AND THE CITIZEN

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demonstrated to those who control our schools.

Let us anticipate, then, the time when every citizen will have a real appreciation of the relationship between himself and the earth. To do this we must look forward, not backward. May I wish for you here in Illinois, clear vision, abundant energy and good luck in this undertaking.

BOOK REVIEWS

THEORETICAL PETROLOGY, by Tom F. W. Barth. John Wiley & Sons, Inc., New York, 1952. 387 pages, 146 figures. $6.50.

This is an advanced book that covers the origin and evolution of rocks from a physical-chemical viewpoint. The famous Norwegian Petrologist interprets experimental data from various geophysical and geochemical laboratories throughout the world. The book should prove to be an outstanding advanced text and reference work in its field.

Part I treats "Physics and Chemistry of the Earth" covering the origin, heat, strength, composition, structure and geochemical cycle of the earth. Part II, entitled "Formation of Sedimentary Rocks," takes up the physical-chemistry of sedimentation and sedimentary differentiation. Part III considers "Igneous Rocks" and is the main part of the book. It starts with a discussion of the classification of igneous rocks and petrochemical calculations. This is followed by a discussion of the phase rule and its applications to such mineral groups as silica, the feldspars, feldspathoids, melilites, olivine, pyroxenes, and their interrelations. Finally, Barth considers such topics as the crystallization problem in basaltic magmas, immiscibility, the vapor phase and hydrothermal differentiation, magmatic differentiation in general, rock series, basalts of the

(*Continued on page* 42)

BOOK REVIEWS *(Continued)*

oceans and continents, orogenic rock series, and granitization. The fourth and last part of the book discusses metamorphic rocks and includes, in addition to the more usual topics, chapters on thermodynamic principles, silicates and gaseous phases, metamorphic diffusion and differentiation, special mineral facies and migmatites.

The book presents a thorough, comprehensive and scholarly coverage of the topics listed and is well illustrated by drawings and diagrams.

—*W.H.P.*

RECLAMATION IN THE UNITED STATES, by Alfred R. Golze. McGraw-Hill, New York, 1952. 451 pages. $8.00.

This book is one of the texts in the McGraw-Hill Civil Engineering Series. Its purpose is to provide instructional material for college courses in engineering and economics related to reclamation and to provide reference material for research or review of the reclamation programs of the United States. Reclamation is defined in the book as "the process of reclaiming the desert lands of the western United States

(Continued on page 43)

BOOK REVIEWS *(Continued)*

through irrigated agriculture, supported by coordinated development of hydroelectric power." The text emphasizes the historical background of reclamation in the United States and presents historical facts and current data on reclamation work, as dictated by law and as carried out by federal, state, and private agencies.

The economics of reclamation is covered in detail in several chapters in the book including cost estimation, allocations of cost, and the financing of reclamation programs. All recent advances in the field of water reclamation are discussed in detail including single purpose projects as well as multiple purpose projects, and river basin development, such as the development of the Missouri Valley. These projects are all illustrated by the detailed explanation of actual reclamation projects of the western states. Other topics discussed include the complex engineering and economic investigations preliminary to the construction of projects, the problems involved in the marketing of electric energy from public plants, latest methods of selecting war veterans for settlement on public lands, and

(Continued on page 45)

Classified Ads — Rates: 35 cents a line, 3 lines for $1.00.

RUBBER STAMPS MADE TO ORDER. Up to three inches long. One line 80c, two lines $1.05, three lines $1.45. Lloyd W. Harazim, 2364 No. 58th, Seattle 3H., Wash.

TONOPAH, NEVADA, is where C. C. BOAK lives, with his outstanding, scientific, world-wide collection of MINERAL, GEM and SEMI-GEMSTONE species — CRYSTAL groups, ROCK PICTURES, Etc. Visitors welcome. C. C. BOAK, 511 Ellis St., Tonopah, Nev.

FOSSIL TRILOBITES, Ill. & Utah specimens, large size $2, medium size $1.50, small $1. These are flat. N. Carter, Elkhorn, Wis.

SAPPHIRIZED TITANIA — IT IS COATED. The only titania gem with lifetime guarantee against wear and damage. WRITE TODAY for illustrated folder and prices. GLENN J. PICKENS, 5715 S.E. 21st Ave., Portland 2, Ore.

WANTED: Will pay $1 each for copies of Earth Science Digest for Aug., Sept., Dec., 1946; March, Sept.-Oct., 1947; 50c for Jan., 1949. Earth Science Digest, Box 1357, Chicago 90, Illinois.

BEST MOSS AGATE IN REDS, YELLOWS AND BROWNS at 25c per inch in 3/16th inch slabs. Also rough material—Oregon wood, jasper, agate, obsidian and thunder eggs at 10 lbs. for $5.00. Please add postage. ROY'S ROCK SHOP, BOX 133, TRINIDAD, CALIF.

VARIOUS IMITATION STONES removed from jewelry—500 small or 100 medium, or 50 extra large size $5.00. Ten pounds broken costume jewelry containing lots of imitation stones $10.00. B. Lowe, Holland Bldg., St. Louis 1, Mo.

BARRELL HAND-LAP-KITS are for you. No power tools or past experience required. Kits contain a select (roughed out) gem. You finish in about one hour with materials provided. Re-use Lap indefinitely with refill materials available. Price $2.50 *postpaid* for 1 stone kit, $5.00 *postpaid* for 3 stone kit. Excellent for Christmas gifts. State Choice of stone: Tigereye, Bloodstone, Californite, Carnelian, flowering Obsidian. R. F. Barrell, 89 Richmond Ave., Lancaster, N.Y.

BOOKS FOR COLLECTORS AND LAPIDARIES—*Gem Trail Journal* for your field trips, price $2; *Indian Silversmithing* is an excellent work for the lapidary, $4.75; Dake's Gem Cutting $2; English's Getting Acquainted with Minerals $4.50; Dana-Hurlbut's Minerals and How to Study Them $3.90. Ask for other titles. Paul VanderEike, Rt. 2, Box 1168, Vista, Calif.

FERN FOSSILS from world-famous Mazon creek. Leaves or stems. Symmetrical doubles (positive and negative), $1.50 to $4.50; singles, 75c to $3.00; fragments, but showing fine detail, 25c to $1.00. Sizes small, medium, large. Quality fair, good, fine; no bad ones. Postage extra. Minimum order $1.00. J. Daniel Willems, Box 1515, Chicago 90.

SPECTROSCOPE for ore and mineral identification. Quickest of all analytical methods, $3.00. Catting Sons, Los Altos, Calif.

U.S. GEOLOGICAL SURVEY BULLETINS, other publications, back numbers bought & sold. Also files of periodicals. J. S. Canner & Company, Inc., Boston 19, Mass.

"OVERLOOKED FORTUNES" in the Rarer Minerals! Find War Minerals. Here are a few of the 40 or more you may be overlooking: Uranium, Vanadium, Columbium, Tantalum, Tungsten, Nickel, Cobalt, Tin, Molybdenum, Germanium, Platinum, Palladium, Bismuth, Titanium, Chromium, Antimony, Mercury, etc. Cassiterite now $1,000 ton; Bismuth $1,500 ton; Columbite $2,500 ton; Tantalite $5,000 ton; Tungsten $3 pound; Platinum $90 ounce, etc. Now you can learn how to find, identify, and cash in on them. Send for FREE copy "Overlooked Fortunes"—it may lead to knowledge which may make you rich! Duke's Research Laboratory, Box 666, Dept. C, Hot Springs, New Mexico.

BOOK REVIEWS *(Continued)*

methods of conserving irrigation water.

This book will prove to be very valuable as a text and reference work because of its comprehensive treatment of the entire subject and the bringing together of the irrigation and hydroelectric components to show their interrelations and interdependence.

—*W.H.P.*

CONNECTICUT MINERALS, *Their Properties and Occurrence*. Hartford: Conn. Geological and Natural History Survey, Bulletin 77.

This substantial pamphlet, by Julian A. Sohon, of the Bridgeport, Conn., library, and edited by Dr. Alexander Winchell, is a fine example of the kind of state mineral guide which should be more generouslly published by our state geological bureaus. It is a revision of a previous bulletin, now out of print, accomplished as a labor of love by a

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BOOK REVIEWS *(Continued)*

librarian, who examined Connecticut mineral localities and scrutinized the literature on such localities available in many eastern libraries.

The localities listed are those mentioned in publications of the last 150 years and this list is neither critical nor descriptive. The first part gives a short account of the minerals, alphabetically, with the localities where each is said to have been found. The second part lists localities with names of minerals reported from each. The third part is a bibliography of useful material on the subject.

Such a list could be made more valuable if it could be followed in a later bulletin with a short descriptive and critical account of the principal localities. Connecticut, however, with this bulletin, continues among the relatively few states that have provided a useful tool for the mineral collector. May many more of the states follow her example.

—*R.P.M.*

GEOLOGY, by O. D. von Engeln and Kenneth E. Caster. New York: McGraw-Hill Book Co., 730 pp., $7.

Several things about this book are unusual—apart from its exceptional weight for its bulk. One is that it is a completely new textbook in geology, an already highly competitive field. Another is that it treats historical geology retrogressively, discussing the Recent and Pleistocene periods first and working backward from them toward the oldest known rocks. Furthermore, the book takes unusual pains about definitions, calling attention to new words with bold face type and derivations from other languages. In other respects this is a good, elementary textbook, well written and illustrated.

A series of paleogeographic maps for each period is one of the helpful details of the book, and so are ample bibliographies with critical annotations. The discussion of cosmic and geophysical problems is placed last in the book, as being the least known and most distant material of geology.

ADVERTISING INDEX

RATTLESNAKE *(from p. 14)*

Here in a huge well lighted case you get a miniature view of a cross section of Rattlesnake Butte.

What of the future of this location? The crystals are still growing, and there will be some there for many years for private collectors willing to work for them. As the land is federal land commercial dealers are discouraged.

One thing I know for certain, I never appreciated the beauty and perfection of this crystal form until I visited the desolate butte on which nature elected them to form.